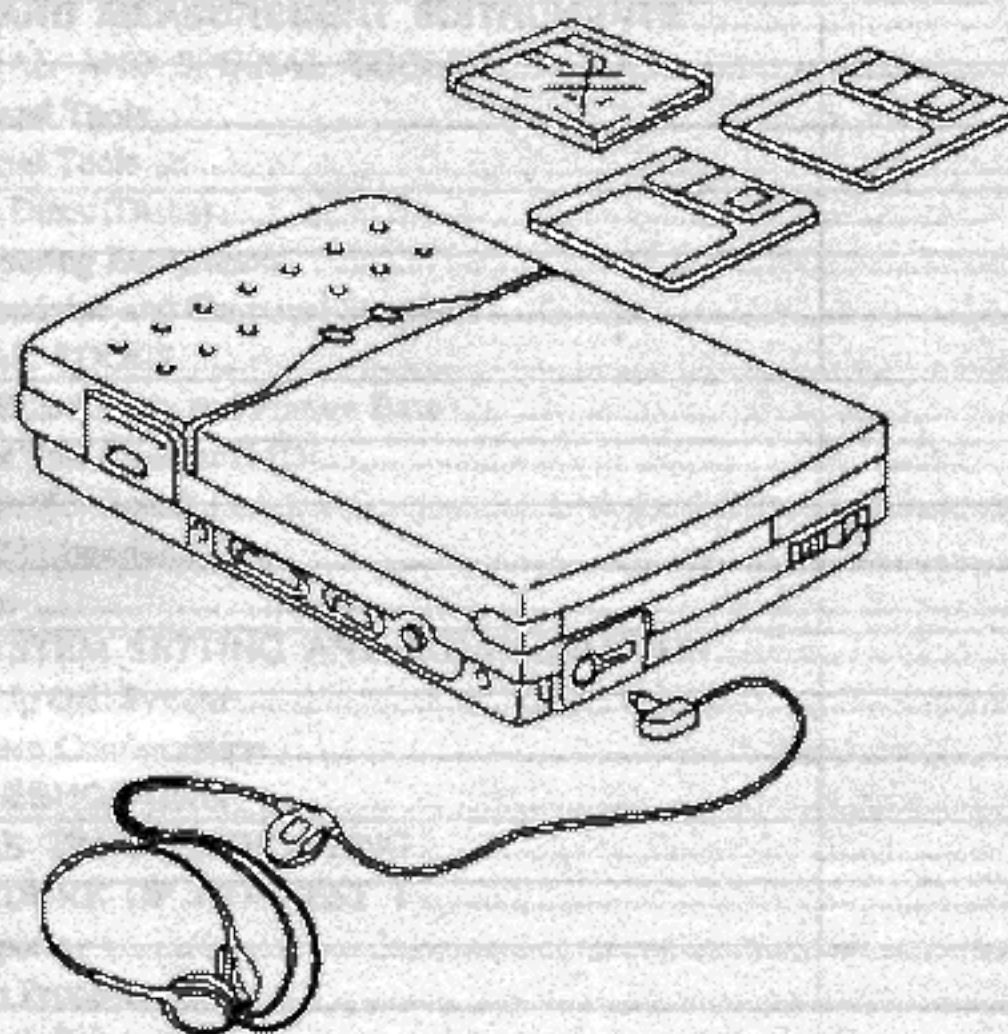


MD DATA DRIVE UNIT

MDH-10



992100210

SONY
SERVICE MANUAL

SECTION 1 INTRODUCTION

1-1 CONFIGURATION OF SERVICE MANUAL

This manual is maintenance guide for model MDH-10 series.

[Section 2](#) describes disc (disk) and tools necessary for maintenance.

[Section 3](#) provides fault diagnostic procedure that may require spare parts, measurement, or adjustment. The overall check (ATP) after part replacement and adjustment will be included in this section.

[Section 4](#) describes how to disassemble / install every part of the unit.

[Section 5](#) describes how to adjust / check the unit after faulty parts replacement, which are found in Section 3.

[Section 6](#) consists of circuit diagrams, assembly drawing, and parts list.

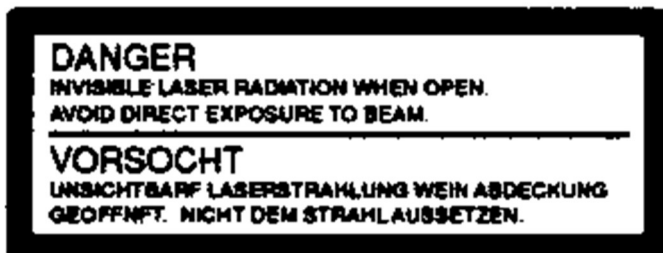
[Section 7](#) describes pin assignment and block diagram of semiconductor.

1-2 CAUTION

Caution: As the laser beam used in the unit is harmful to the eyes, do not attempt to disassemble the enclosure. Refer to servicing to qualified personnel only.

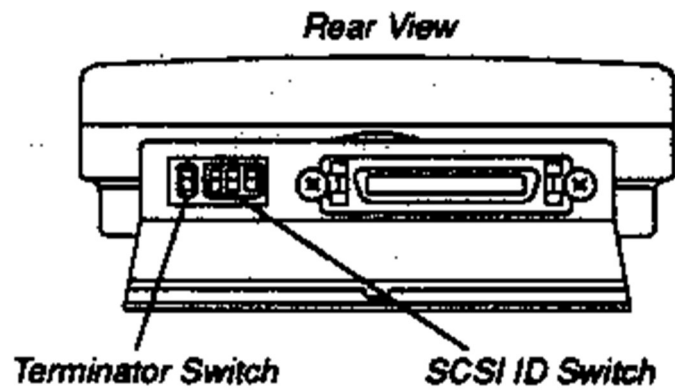


This unit is classified as a CLASS 1 LASER product. The CLASS 1 LASER PRODUCT label is located on the bottom.



The Danger label is located on the Mechanical Deck Cover Ass'y.

1-3 SWITCHES



1-3-1 SCSI ID Select

Assign the drive unit's ID number by setting these switches on ON or OFF. Do not assign the same number as one previously assigned to another SCSI device.

| ID No. | Mark | | |
|--------|------|-----|-----|
| | 2 | 3 | 4 |
| 0 | OFF | OFF | OFF |
| 1 | OFF | OFF | ON |
| 2 | OFF | ON | OFF |
| 3 | OFF | ON | ON |
| 4 | ON | OFF | OFF |
| 5 | ON | OFF | ON |
| 6 | ON | ON | OFF |
| 7 | ON | ON | ON |

1-3-2 Terminator

When the terminator is enabled, the MD DATA drive must be at the last unit in the SCSI chain.



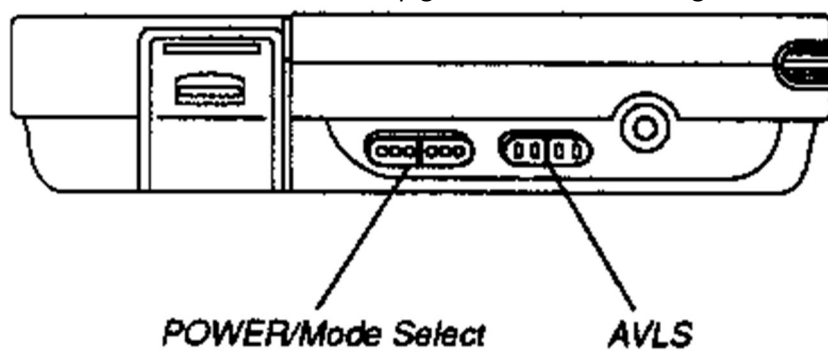
When the internal terminator is not used: OFF



When the internal terminator is used: ON

1-3-3 POWER Mode Select

When Reading/Recording data, set this switch to DATA. Also when playback any audio disc, set this switch to AUDIO. POWER Lamp goes on for both settings.



1-3-4 AVLS

When setting this switch to ON. This function allows you to limit the maximum volume without degrading the sound quality.

SECTION 2

TOOLS AND MEASURING INSTRUMENTS

2-1 GENERAL AND SPECIAL TOOLS

The tools and measuring equipments for performing maintenance on the MDH-10 series are followings.

2-1-1 General Tools

| | SONY Parts No. |
|---|-----------------------|
| + Screw Driver (DK-20) (for 1.4mm) | (7-721-050-09) |
| + Driver 2.6mm | (7-700-749-03) |
| Tweezers | (7-700-753-02) |
| Round Nose Plier | (7-700-757-01) |
| Cutter | (7-700-758-02) |
| Driver (for Volume adjustment) | (7-721-052-07) |
| + Bit (#1) (for Torque Driver)(M0.8 - 2.0) | (7-721-052-91) |
| + Bit (#0) (for Torque Driver)(M1.6, 2.0) | (7-721-052-92) |
| Soldering Iron (20W) | |
| Base Tip for Soldering iron (for FFC removal) | (3-702-088-01) |
| Desoldering Metal Braid (Solder Wick) | |
| Power Supply DC+5V (min 2.0A) | |
| Power Supply -5 ~ -12V (min 1.0A) (only when RF Buffer Board) | |
| BNC Cable (1.5m) | |
| Thermometer (Digital) | |
| Headphone (MDR-E741MP/K2) (for J1) | (8-953-537-94) |
| Headphone (MDR-014MP) (for UC2, CEJ, CEK) | (8-953-009-90) |
| Lip-12 Rechargeable Battery (Lithium-ion battery pack) | |
| SCSI Cable MOA-CIOT (for J1) (Bellows Type/50P-Full-50P-Half) | |
| AC Adapter (for J1) | (1-473-017-11) |
| AC Adapter (for UC2) | (1-473-018-11) |

AC Adapter (for AE4, CEJ)

(1-473-019-11)

2-1-2 Special Tools

Quarter L (PCX-320 Series) system

Followings can be a substitute for the Quarter L system

PS/2 model 30

Dell Optiplex 4100

Note: Fujitsu SCSI card of PCMCIA Ver 2.0 could not be supported.

Note: Following specification are required.

640kbytes or more RAM

w/3.5" Floppy Disk Drive

w/Hard Disk Drive

DOS ver 5.1 or later

| | |
|---|----------------|
| SCSI Cable (E) (for UC2, CEJ, CEK pin type/50p Full-50p-Half) | (J-905-910-0A) |
|---|----------------|

| | |
|----------------|----------------|
| Mech Deck Base | (J-905-914-0A) |
|----------------|----------------|

| | |
|-----------------------------|----------------|
| Over Write Head Height Tool | (J-905-913-0A) |
|-----------------------------|----------------|

| | |
|-----------------------------------|----------------|
| Power Cable (for RF Buffer Board) | (J-609-130-0A) |
|-----------------------------------|----------------|

| | |
|---------------------|----------------|
| BNC (one-end) Cable | (J-907-202-0A) |
|---------------------|----------------|

| | |
|-----------------------|----------------|
| Fixture Base (MDH-10) | (J-905-911-0A) |
|-----------------------|----------------|

| | |
|-----------------|----------------|
| Pin Board Ass'y | (J-905-912-0A) |
|-----------------|----------------|

| | |
|--------------|----------------|
| RS-232 Cable | (J-905-016-0A) |
|--------------|----------------|

| | |
|------------------|----------------|
| RS-232 I/F Cable | (J-905-901-0A) |
|------------------|----------------|

| | |
|---------------------|----------------|
| RS-232 Interface 3V | (J-905-915-0A) |
|---------------------|----------------|

| | |
|--------------------------|----------------|
| RS-232 Cable (Host side) | (J-905-904-0A) |
|--------------------------|----------------|

| | |
|--------------------|----------------|
| Error Rate Counter | (J-905-902-0A) |
|--------------------|----------------|

| | |
|-----------------|----------------|
| RF Buffer Board | (J-905-917-0A) |
|-----------------|----------------|

| | |
|--|----------------|
| MD DATA Power Checker (w/MD Cartridge) | (J-905-905-0A) |
|--|----------------|

AC Adapter (recommend A08017 (AC 90V to 110V (Advantest)) or A08019 (AC 200V to 245V (Advantest))) (for MD DATA Power Checker)

Note: This checker consists of a Power Meter and a MD Cartridge. And only MD Cartridge can be supplied for spare, as part No. J-905-906-0A.

Line Out Cable (J-905-919-0A)

2-1-3 Test Discs (Disks)

Acceptance Test Procedure (ATP) System disk (OR-D707WA) (8-980-300-07)

This disk used for ATP. (for details, refer to [section 3](#))

Function Check Disk (OR-D706WA) (8-980-300-06)

This disk used for unit adjustment. (for details, refer to [section 5](#))

Down Load Program Disk (OR-D702WA) (8-980-300-02)

This disk used for down load program. (for details, refer to [section 5-10](#))

Note: Abovementioned disks can be worked on DOS V5.1 or later.

Re-Writable Adjustment Disc No. 1 (8-980-300-08)

Test Disc (Read Only) (TGYS-9001) (OR-D716WA) (8-980-300-24)

Audio Test Disc (TGYS-1)

These discs (MD DATA) are used for unit adjustment and ATP.

2-1-4 Measuring Equipments

Oscilloscope (mini. 20MHz) (recommend Analog Type)

Frequency Response Analyzer (recommend 5010A (NF Electric Instruments))

Jitter Meter (recommend DB-3260 (KENWOOD))

EF Phase difference Meter (recommend Phase Detector for MD (COPERU Co.))

SCSI Board (The SCSI Master (ADAPTEC AHA1542/1522/1742))

Pulse Jitter Counter (recommend TR5834/TR5835 (ADVANTEST))

Digital Multi Meter

2-1-5 Expendable and Chemical Supplies

Cleaning Liquid Lens (J-250-100-0A)

Cotton Swab (200pcs) (7-740-900-65)

Diamond Oil (NT-68)

(7-661-018-18)

Sankol (FG-84M)

(7-662-001-36)

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ADAPTEC is a registered trademark of Adaptec, Inc. of the U.S.A. Other names of the companies and products appearing in this manual are trademarks or registered trademarks of those companies.

2-2 SPECIAL TOOLS

2-2-1 Pin Board Ass'y and Fixture Base

(1) Configuration (Refer to Fig. 2-2-1)

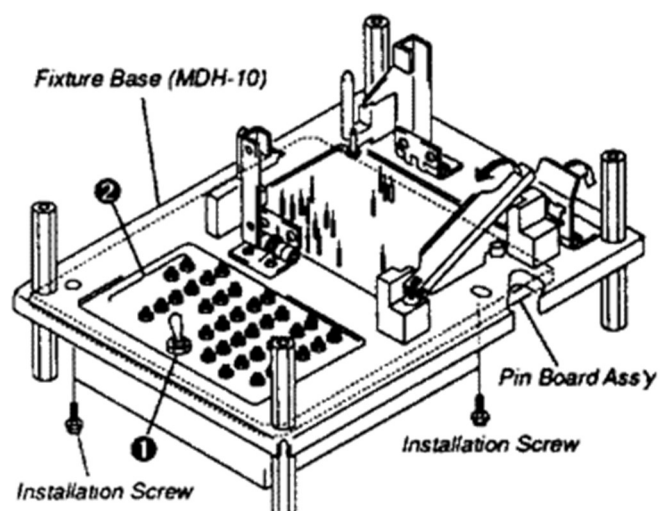


Fig. 2-2-1 Installation to Fixture

| REF. | Description | REF. | Description |
|--------|-------------|--------|-------------|
| AP1013 | VC | AP7010 | MT0 |
| AP1015 | E | AP7011 | WFCK |
| AP1022 | F | AP7013 | DTSY |
| AP105 | RFGND | AP8114 | 3.5V1 |
| AP126 | LDI0 | AP8116 | 3.1V |
| AP127 | LDI1 | AP8118 | TXD |
| AP5020 | RF | AP8119 | RXD |
| AP5030 | ABCD | AP8120 | -RST |
| AP5050 | FBIAS | SP110 | TAO |
| AP5060 | TE-O | SP5040 | APCREF |

| | | | |
|--------|----------|--------|--------|
| AP5070 | FE-O | SP5090 | FEO |
| AP5124 | SERVOGND | TP722 | ATER |
| AP5126 | TI | TP8332 | UNREG1 |
| AP5127 | FI | TP8333 | 2.85V |
| AP5128 | FDI | TP8338 | OP/CL |
| AP5129 | TDI | TP8339 | UNREG2 |
| AP7007 | MT3 | TP8340 | 3.5V2 |
| AP7008 | MT2 | TP8341 | 4.75V |
| AP7009 | MT1 | TP8342 | GND |

(2) Pin Board Ass'y Function

Switches

❶ FBIAS ... This switch is used for Focus Error offset (FE) adjustment. (Set this switch to "Short" during FE adjustment, and set to "Open" during FBIAS Adjustment.)

❷ Test terminals

When using following Test terminals listed below on the Pin board, you can easily conduct any adjustment or measurement.

(3) Installation to Fixture Base (MDH-10)

- Remove the installation screws (4pcs) from the Fixture Base.
- Carefully attach the Pin Board Ass'y to the Fixture Base.
- Loosely fasten installation screws (4pcs) for adjustment later.
- Put a drive to the base and slide it in place.
- Push Pin Board up so that the positioning openings of drive's Mounted Board and positioning pins are aligned straightly.
- Fasten installation screws (4pcs) completely and then remove the drive from the Fixture.

2-2-2 Error Rate Counter (MD)

This enable you to count C1, C2 errors which appear when reading data and also to monitor AT errors of address (ADIP signals) which have already been recorded in Re-writable Adj. Disc or

Read Only Disc.

(1)

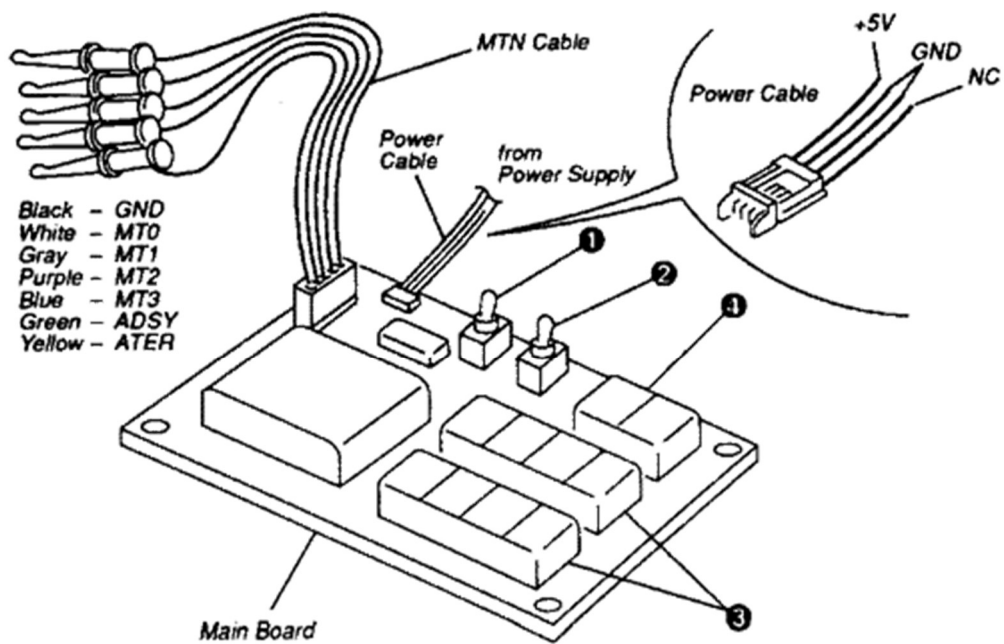


Fig. 2-2-2 Error Rate Counter (MD)

Configuration (Refer to Fig. 2-2-2)

Main Board

MTN Cable

Power Cable

(2) Error Rate Counter (MD) Function

Switches

❶ SW1 ... This switch is to supply DC5V voltage to this board.

❷ SW2 ... When it is set to 10sec side, this will show the count number of C1, C2 and AT errors appeared in 73500 frames (ten times as large as 7350) every 10 seconds. They are 10 times as large as the usual ones (no. of C1, C2, AT errors in 7350 frames). Divide the total numbers by 10, and you can get the average numbers.

Indicators

❸ C1/C2 Error (LED1 to 8) ... These indicate numbers of two types of data errors; Random error and Burst error. The random error is an error of 1-2byte long which appears all over the disc and the Burst error is a long error which locally appears in the disc.

To correct MD Data errors, CIRC (CD's error correction system) is used. The CIRC uses two layered correction codes, C1 and C2. C1 for correcting Random Errors and C2 for correcting Burst Errors.

The C1 count of this error rate counter indicates number of frames where any C1 corrections were made. The C2 count indicates number of frames where an error(s) could not be corrected even after C1 and C2 corrections were applied. Usually maximum 220 count of C1 error is allowed, but C2 error must be 0 to retrieve correct data. In case of reading Rewritable Adj. Disc, C2 error normally occurred at linking points between clusters, because recorded data is discontinued. A continuously recorded cluster area is necessary to measure true C2 error rate. Follow instructions in each section for the correct procedure.

❹ ATER (LED9 and 10)... The Rewritable Adj. Disc has address (ADIP signals) which show the

location of cluster/sector. This monitors ADIP signal Read errors (ATER) every sector (98 frames) and indicates count No. of errors appeared in 75 sectors (7350 frames).

2-2-3 RF Buffer Board

This board shows +/- 12V with silk pattern but this board works with any of +5 ~ +12, and -5 ~ -12V.

(1) Configuration (Refer to Fig. 2-2-3)

Main Board

Cable (2 pcs)

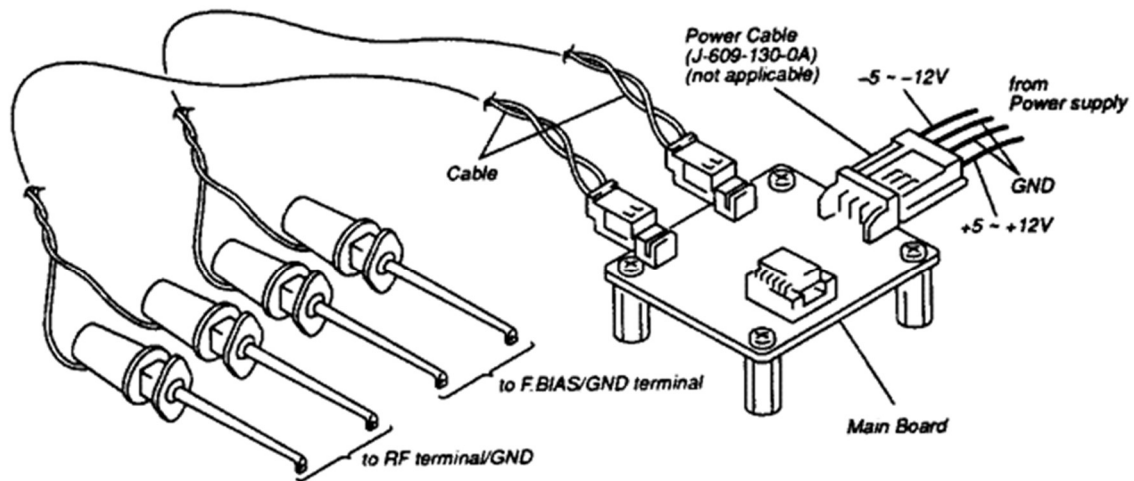


Fig. 2-2-3 RF Buffer Board

2-2-4 RS-232 Interface 3V

This board is used for Adjustment or Function Check.

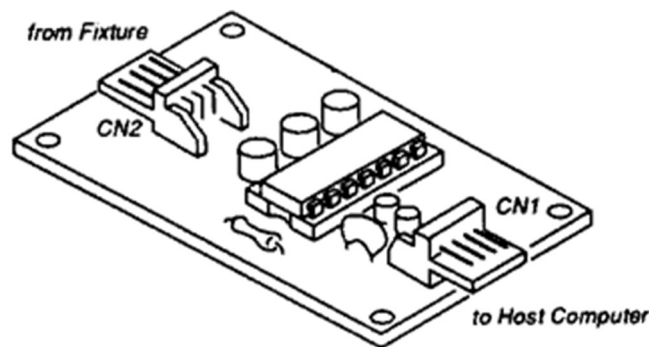


Fig. 2-2-4 RS-232 Interface 3V

2-2-5 Discs

Test discs used in this manual are manufactured and prepared for the drive manufacturing and servicing use. Physical characteristics are qualified and special data for unit adjustment and evaluation is written. For the adjustment procedure in this manual, be sure to use specified disc with right data recorded. For the ATP and function test, you may use other discs, however, you might see some trouble due to the disc problem. Especially for the Rewritable Adj. Discs, continuous data must be written in the specific address area without error and defect. Format

the disc to be repaired with SAFE FORMAT option and repair destroyed data on a standard disc. (Refer to Instruction Manual for details.)

2-3 Q/L SYSTEM SETTING AND CONFIGURATION

2-3-1 Set Up Q/L System

Note: Make sure DOS (Ver. 5.1 or later) has been installed in the hard disk.

Note: ASPI4DOS.SYS of Device Driver for SCSI board has been installed in Config.SYS. (For the installation, refer to its instruction manual.)

2-3-2 System Configuration

a. Set dip switches on the SCSI Board as below. (Default I/O address on the Board is set to 330h, if you want to use other than address 330h, refer to the instruction manual I/O address setting.)

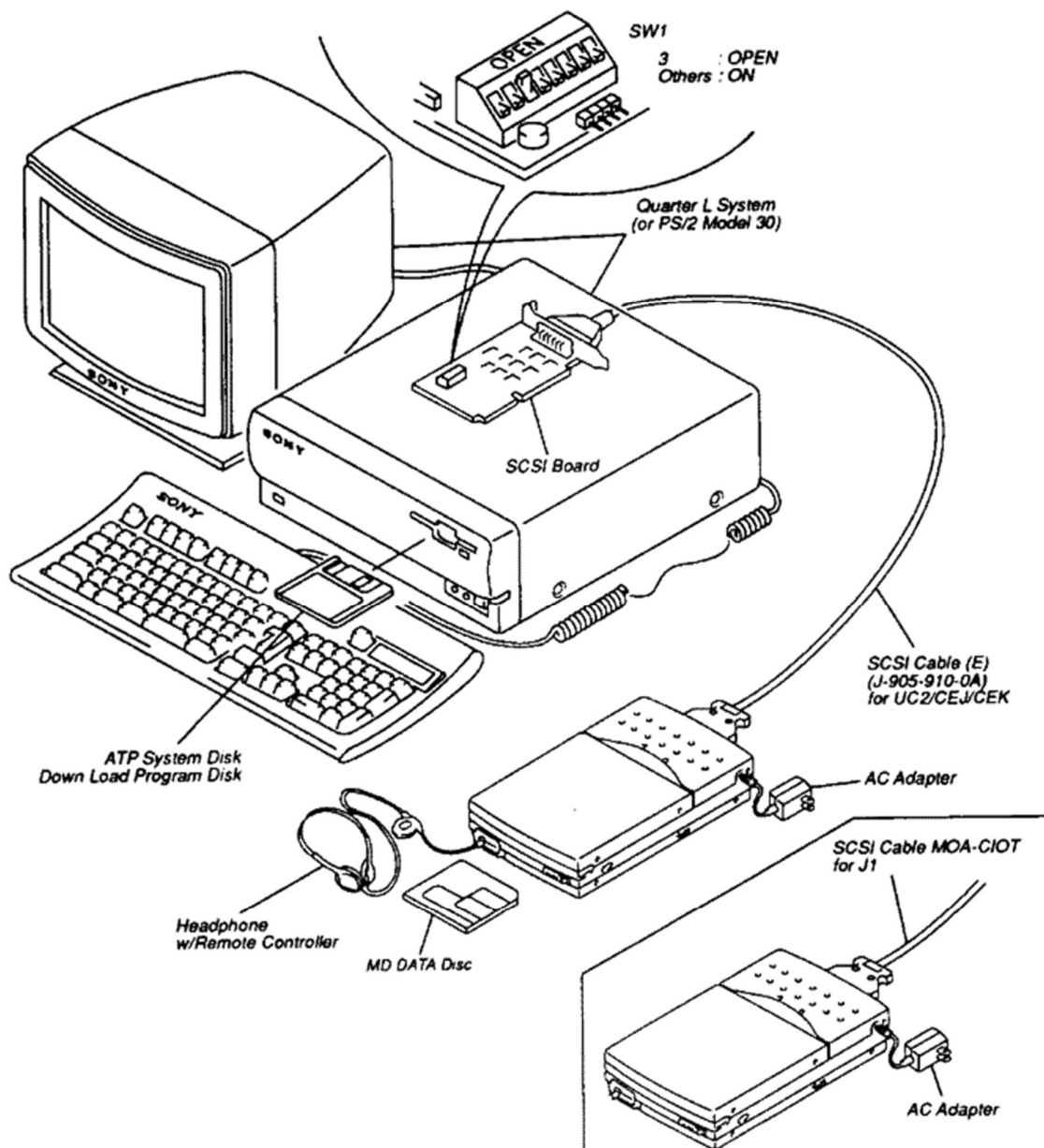


Fig. 2-3-1 ATP2 and Downloading System

(page break)

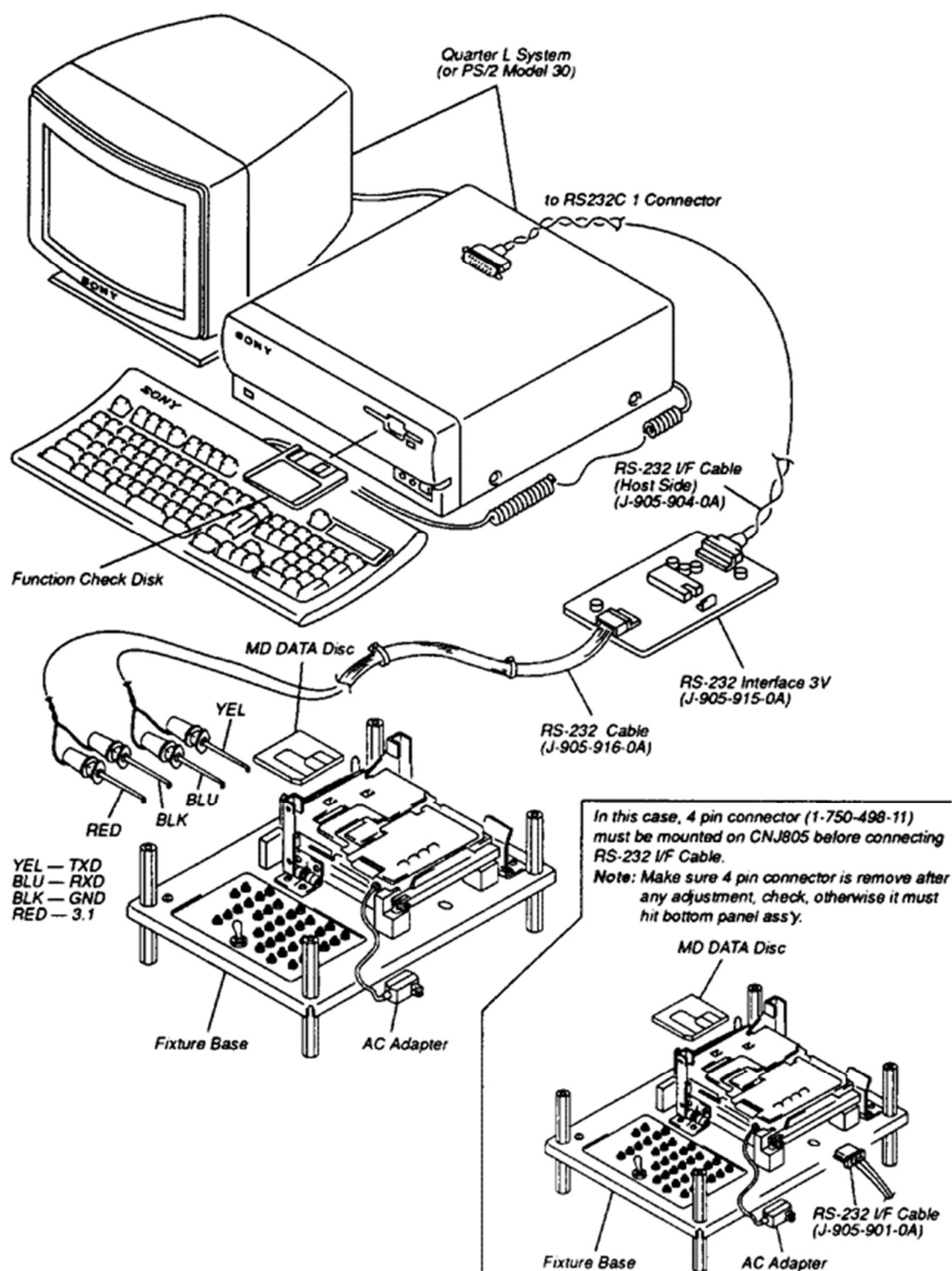


Fig. 2-3-2 Function Check and Adjustment

SECTION 3

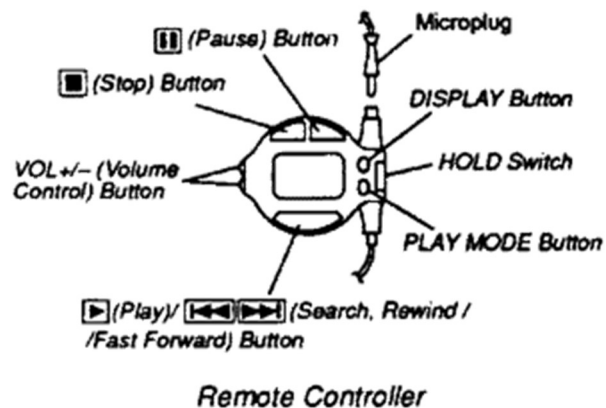
TROUBLESHOOTING

This section describes troubleshooting method. Section [3-2](#) and [3-4](#) described ATP (Acceptance Test Procedure) procedure. In your repair work, you can easily check how the drive is functioning and determine whether it is really faulty or not. If some error occurs during ATP, define the defective block (part) in accordance with Function Check and the procedure in section [3-3](#) and [3-5](#).

3-1 BEFORE TROUBLESHOOTING

The following procedure is recommended to verify if the unit is really faulty.

- a. Poor connection with the host system (esp. SCSI Cable, GND-related connection, frame GND, etc.)
- b. Incorrect operational procedure.
- c. Program error of host system.
- d. Wrong SCSI ID selection.
- e. Wrong supply voltage or power source is not connected.
- f. Environmental conditions. (where electrical noise easily jumps into signal.)
- g. Influence of strong magnetic field.
- h. Doubled I/O address setting on the SCSI boards.
- i. Dirty test disc.



3-2 PROCEDURE OF ATP TEST 1

3-2-1 Preparing

Headphone with a remote controller

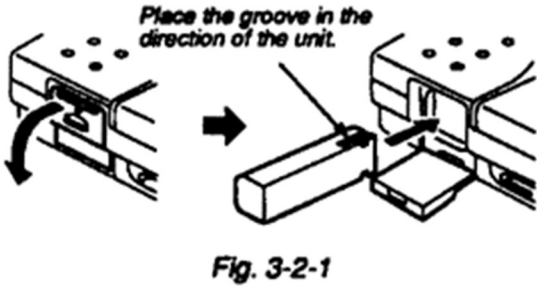
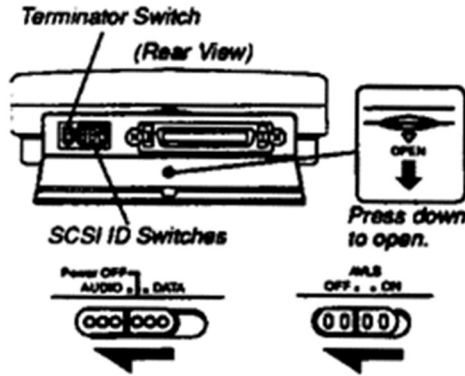
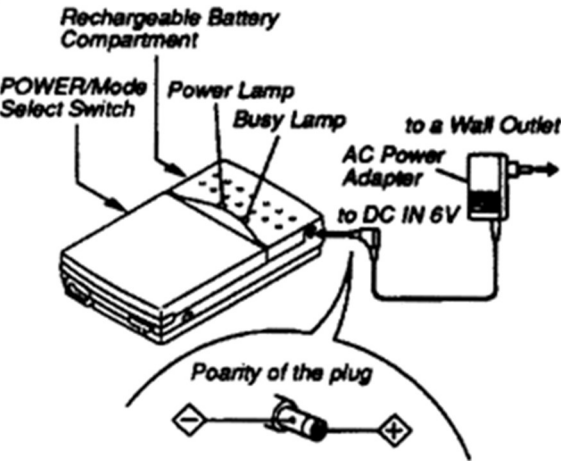
AC Adapter

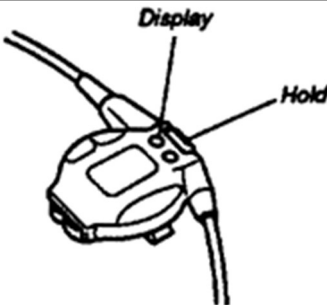

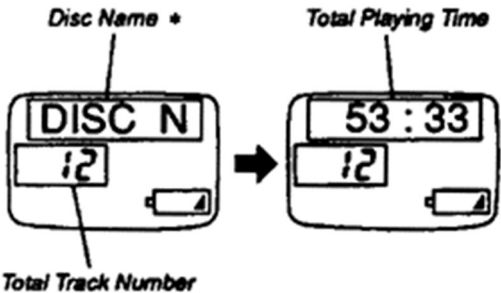

Audio Test Disc (TGYS-1)

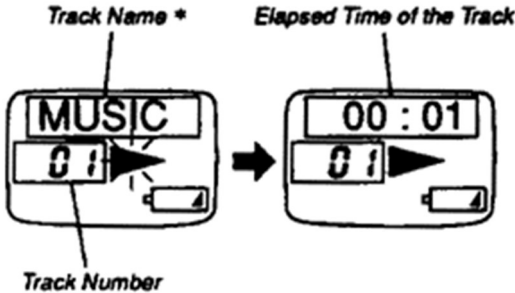







Battery pack (discharged)

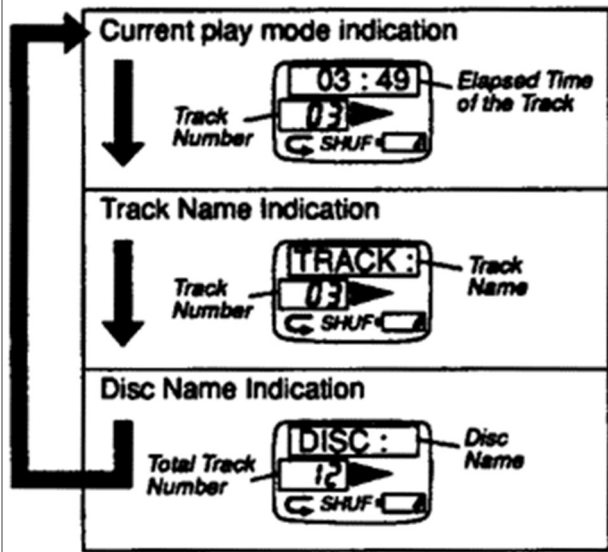
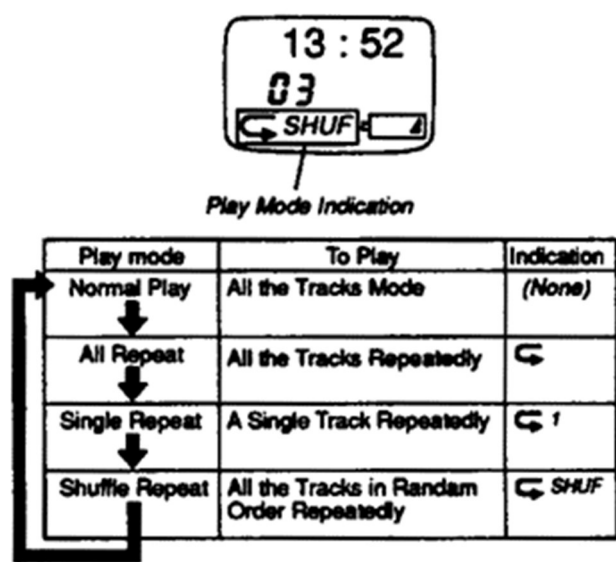
Note: Make sure Battery pack is 3V or less in accordance with section [5-3](#).

3-2-2 Test Procedure

| Test Procedure | Check point |
|---|--|
| <p>a. Power Circuit Check</p> <p>a-1. Set a battery pack into the unit under test. (No need to connect a AC adapter.)</p> |  <p>Fig. 3-2-1</p> |
| <p>a-2. Set the switch on the unit as below.</p> <p>POWER/Mode : Select AUDI O</p> <p>Terminator/SCS : don't I care</p> <p>AVLS : OFF</p> | <p>Power LED (Orange) blinks.</p>  <p>Fig. 3-2-2</p> |
| <p>a-3. Set a AC Adapter into the unit.</p> | <p>Charging to the Battery automatically starts and the Power LED color switches with orange.</p>  <p>Fig. 3-2-3</p> |

| Test Procedure | Check point |
|--|---|
| <p>b. Command Check using a Remote Controller</p> <p>b-1. Connect the unit to a Headphone with a remote controller.</p> <p>b-2. Set the switch on the unit and a remote controller as below.</p> <p>Hold : off</p> |  <p>Fig. 3-2-4</p> |
| <p>b-3. Insert a Audio Test Disc (TGYS-1) to the unit.</p> | <p>After a while, following indication (Disc Name, Total playing Time, Track No., Battery Condition) appears in the display window of the remote controller.</p> <p>Disc Name : MD AUDIO TEST 1</p> <p>Total Playing Time : 45 : 51</p> <p>Track No. : 99</p> <p>Battery Condition : </p>  <p>Fig. 3-2-5</p> <p>* No indication appears with MDs that have not been electronically labeled.</p> |
| <p>b-4. Press the Play button  on the remote controller.</p> | <p>The unit will start playback. The track No. and the elapsed time of the track will appear in the display window.</p> |

| Test Procedure | Check point |
|---|--|
| |  <p>The diagram illustrates the display's state during playback. On the left, the display shows 'MUSIC' as the Track Name, '01' as the Track Number, and a progress bar. An arrow points to the right, where the display shows '00:01' as the Elapsed Time of the Track, with the Track Number '01' and progress bar still visible. Labels with leader lines identify 'Track Name *', 'Elapsed Time of the Track', and 'Track Number'.</p> <p>* No indication appears with MDs that have not been electronically labeled.</p> <p><i>Fig. 3-2-6</i></p> |
| b-5. Adjust the volume by pressing the + side or - side of VOL+/- button on the remote controller. | The volume will increase (decrease) on the display window. |
| b-6. Set the AVLS switch to ON, and repeat item b-5. | The volume will not be more than half level of the volume indication, when pressing the + side of VOL+/- button. |
| b-7. Keep pressing the fast forward key  on the remote controller. | The unit quickly fast forward. |
| b-8. Keep pressing the rewind key  on the remote controller. | The unit quickly rewind. |
| b-9. Press the fast forward key  on the remote controller once. | The unit find the beginning of the next track and will start playback. And make sure two short beeps, and turn with next track no. on window display. |
| b-10. Press the rewind key  on the remote controller once. | The unit find the beginning of the current track and will start playback. And make sure three short beeps. |
| b-11. Press the pause/release button  on the remote controller once. | The unit is set in pause mode. And make sure continuous short beep. |
| b-12. Press the pause/release button  again. | The unit will release pause mode and will start playback again. And make sure beep stops. |
| b-13. Press the stop button  on the remote controller. | The unit will stop playback. And make sure one long beep. |
| c. Displaying disc and track names elapsed time during play back. | |

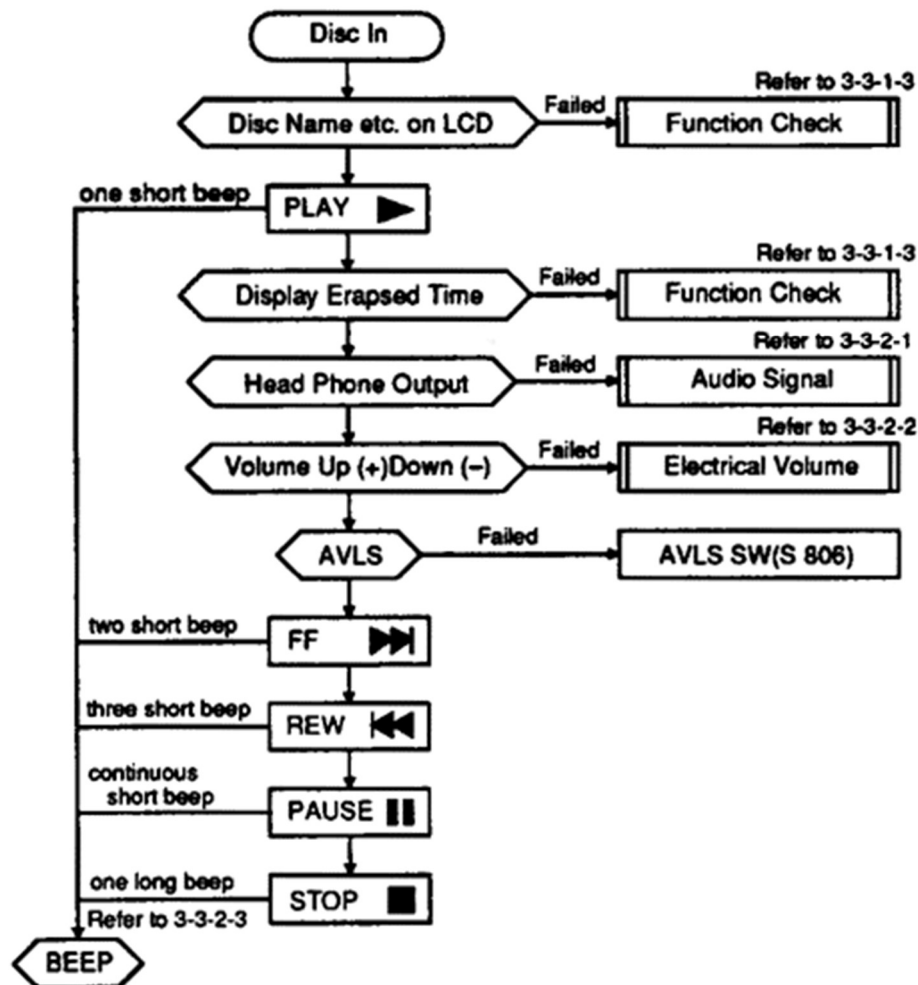
| | |
|--|--|
| Test Procedure | Check point |
| c-1. Press the DISPLAY button during play back. | <p>Each time, the indication changes as follows:</p>  <p style="text-align: center;"><i>Fig. 3-2-7</i></p> |
| d. Repeated Playback | |
| d-1. Press the PLAY MODE button on the remote controller during play back. | <p>Each time, the indication changes as follows:</p>  <p style="text-align: center;"><i>Fig. 3-2-8</i></p> |
| e-1. Eject the disc. e-2. Turn off the power and disconnect the unit. | |

3-2-3 Check Point

| Test Items | Check Point | Remarks |
|---|------------------------------|----------------------------------|
| Power Circuit | 1. FFC Connection | CN801 |
| | 2. Voltage Output | Refer to 5-3 |
| | 3. Battery Monitor | Refer to 3-3-1 |
| Command Check using a remote controller | Drive function (IC705/IC707) | Refer to 3-3-1-3 |
| Display | +B power | 3.5±0.1V (TP325) is obtained. |
| Repeated Playback | Audio Output | Refer to 3-3-2-1 |
| | electrical volume (IC314) | Refer to 3-3-2-2 |
| | Beep | Refer to 3-3-2-3 |
| | AVLS switch | S806 |

3-3 AUDIO FUNCTION CHECK

The following flowchart shows an example of typical procedure to check a faulty drive and to identify defective part in the audio circuit.



3-3-1 Serial Control

3-3-1-1 Pre-setting

- Set the switches on the unit as below.

Power / Mode Select : Data

Others : don't care

- Connect the unit to the host computer through a serial port as shown in [Fig 2-3-2](#)

Note: After connecting the drive to be tested, load TEST program in accordance with [section 5-1](#).

3-3-1-2 Battery Monitor

- Connect the AC Adapter, and put the LIP-12 Rechargeable Battery (discharged) to the unit.
- Put **rffdc1** on cmd [x]> line. (Read A/D data of battery voltage.)
- The value should be less than 61 (hex).

Note: When it is in the specification, check the logical level of CHGC (TP8337) signal and POWER2 (TP8330) signal. If both of those signals are True, DC-DC converter unit is faulty. If the

A/D data does not satisfy the specification, check DC-DC output voltage and battery monitor circuit.

3-3-1-3 Function Check

- a. Insert a Audio Test Disc (TGYS-1) to the unit.
- b. Execute the check procedure from [3-5-2](#) (Status Check) to 3-5-10 (Read TOC/UTOC).

Note: If no trouble can be found, IC705 (CXD1805AR) or IC707 (CXD2927R) is defective.

3-3-2 Audio Mode

3-3-2-1 Audio Signal

If the elapsed time goes on, but no sound can be heard from the head phone, check the audio signal by using the oscilloscope.

- a. Set oscilloscope as below.

Display : CH1

Range : 1V/div. DC 1ms/div.

Trigger : Auto
- b. Set the Power/Mode SW to Audio.
- c. Connect the AC adapter to the unit.
- d. Insert a Audio Test Disc (TGYS-1) to the unit.
- e. Start playing track 1 (1kHz 0DB L&R) using the remote controller.
- f. Connect the probe to the test point as following sequence, and check the waveform (1kHz) shown in [Display 5-7](#) appears on the oscilloscope.
 1. TP330 (R-ch) and TP329 (L-ch)
If no signals, check J302 connection.
 2. TP344 (R-ch) and TP346 (L-ch)
Check if the voltage of $3.1 \pm 0.1V$ DC. is obtained at AP336. If not, the headphone amp (IC310) is faulty.
 3. TP336 (R-ch) and TP338 (L-ch)
Check if the voltage of $3.3 \pm 0.1V$ DC. is obtained at AP335. If not, the electrical volume (IC314), A/D converter (IC306), ATRAC (IC707 - CXD2927R) is faulty.

3-3-2-2 Electrical Volume

- a. Set oscilloscope as below.

Display : CH1

Range : 1V/div. DC 1ms/div

Trigger : Auto

- b. Set the switches on the unit as below.

Power / Mode Select : Audio












AVLS : off

- c. Connect the AC adapter and insert a Audio Test Disc (TGYS-1) to the unit.
- d. Start playing track 1 (1kHz 0DB L&R) using the remote controller.
- e. Adjust the volume by pressing + side or - side of the VOL+/- button. And check if the waveform at TP330 (R-ch) and TP329 (L-ch) changes zero level to maximum level ($1.6 \pm 0.3V_{p-p}$) in accordance with the volume indicator.

Note: If it doesn't change, check the electrical volume (IC 314) and its control signals.

3-3-2-3 Beep

Beep sounds shown in the following table will be heard on the headphone when operating on the remote controller.

| To | Press | Beep |
|---|---|------------------------------|
| Play |  | •(one short beep) |
| pause/release pause |  | •••••(continuous short beep) |
| stop |  | ————(one long beep) |
| rewind while listening | keep pressing  | (none) |
| fast forward while listening | keep pressing  | (none) |
| quickly rewind without listening |  (pause) and keep pressing  | (none) |
| quickly fast forward without listening |  (pause) and keep pressing  | (none) |
| find the beginning of the current track | press  once shortly | •••(three short beeps) |
| find the beginning of the next track | press  once shortly | • (two short beeps) |

If incorrect or no beep can be heard on the headphone, check the voltage of $3.5 \pm 0.1V$ DC. on +B line (TP325), or the key detection circuit is faulty.

3-4 PROCEDURE OF ATP TEST 2

3-4-1 Pre-Setting

- a. Connect a reference unit (brand-new) to the ATP System. (Refer to [Fig. 2-3-1](#)) If the defective drive is connected, this program may not boot up.
- b. Turn on the power (The mode SW is "DATA") of reference unit first (brand-new), then computer.
- c. After system loading, insert ATP System Disk (OR-D707WA) into Drive A.
- d. Change directory in drive A.
- e. Turn off the power of the Unit.
- f. Change the reference unit with one to be tested, and then turn on the power (The POWER/Mode Select is "DATA") again.
- g. Set some switches on the unit so that its setting is the same as factory shipping in accordance with [table 6-1-2](#).
- h. Type **ATPMD** and **Enter** key. (After test program loading, Display 3-4-1(a) shows up.)

Note: If the SCSI ID is not set to ID 3, use "-l<id>" option with **ATPMD**.

ex.: **ATPMD -l1**

Display 3-4-1(a)

ATP for MD DATA (ver x.xx) (C) Copyright SONY Corp. 1994

INQUIRY

Vendor : SONY

Product : MDH-10

Version : x.xx

Do you want to start ATP? ([Y]/N/Q)

3-4-2 Test Procedure

- a. Press **Y** to start ATP. (Display 3-4-1(b) or (c) shows up)

Note: In case of escape from ATP, press **N** key.

Note: If any disc is inserted in the drive, following message will Display 3-4-1(b) shows up. If not Display 3-4-1(c) shows up.

Display 3-4-1(b)

Please eject disc. (If it is inserted)

Display 3-4-1(c)

Please Insert Test Disc

- b. Insert Re-Writable Adj. Disc to the unit under test. And the result (OK or NG) of each test item on the Test Result column will appear as below.

Note: If any of error occurs during ATP, Display 3-4-1(e) shows up.

Display 3-4-1(d)

Read Capacity Test XX

Disc Capacity xxxxx blocks (xxxx bytes/block)

TOC read XX

UTOC read XX

Start/Stop.....

 :Start :xxxxmsec.

 :Stop :xxxxmsec.

 >Error Start : x

 >Error Start : x

 XX

Rezero XX

Seek.....

Average: 00000 --> xxxxx : xxxxmsec. xxxxx -> 00000 : xxxxmsec. Error = x

Average: xxxxx --> xxxxx : xxxxmsec. xxxxx -> xxxxx : xxxxmsec. Error = x

Average: xxxxx --> xxxxx : xxxxmsec. xxxxx -> xxxxx : xxxxmsec. Error = x

Average: 00000 --> xxxxx : xxxxmsec. xxxxx -> 00000 : xxxxmsec. Error = x

 XX

Read.....

Average: xxxxmsec. XX

Write.....

Average: xxxxmsec. XX

Display 3-4-1(e)

Continue ? ([Y]/N)

- c. If the test using Re-Writeable Adj. Disc is completed, then Display 3-4-1(f) shows up. Eject the Re-Writable Adj. Disc to unit. (Display 3-4-1(g) shows up.)

Display 3-4-1(f)

Please eject Test Disc.

Display 3-4-1(g)

Please Insert Audio Test Disc.

- d. Put a headphone and insert Audio Test Disc (TGYS-1) to the unit under test. And playing audio starts. Then set volume so that it centers.

Display 3-4-1(h)

Does any sound play back? ([Y]/N)

- e. If any sound can be heard from the headphone, hit **Y** key to continue the test. If not, Audio circuit should defective and hit **N** key to escape from the Audio test.
- f. After Audio test, the result (OK or NG) of each test item on the Test Result Column will appear as below.

Display 3-4-1(i)

| | |
|------------|-----------------------------|
| Play Audio | XX (<-- Test Result Column) |
|------------|-----------------------------|

- g. If the test using Audio Test Disc (TGYS-1) is completed, and Display 3-4-1(j) shows up.

Display 3-4-1(j)

Result OK

- h. Eject the Audio Test Disc (TGYS-1) to the unit.

Display 3-4-1(k)

Do you test another drive? (Y/[N])

3-4-3 Check Point

This section describes check points which come out in accordance with test procedure in [3-2-2](#).

| Test Items | Check Point | Remarks |
|---|--|--|
| Inquiry | 1. SCSI ID No. | Check if it has doubled SCSI ID No. on the same SCSI line. |
| | 2. SCSI Termination | |
| | 3. Cable connection | |
| | 4. Voltage Output | Refer to 5-3 |
| | 5. Others | Refer to 3-5 |
| Read Only Disc Request sense | 1. ROM (Ref. no. IC 812) | Refer to 5-8 |
| Read capacity Mode sense/select TOC read Rezero Seek Read | 1. Disc | Different type of disc is set. |
| | 2. Voltage Output | Refer to 5-3 |
| | 3. LD Power | Refer to 5-2-3 Dirty lens (Refer to 5-9) |
| | 4. Spindle motor | Refer to 5-6 |
| | 5. Sled operation | Visually Check (Refer to 3-5-4) |
| | 6. Limit SW (Ref. no. S705 - Mech-Con PCB) | |
| | 7. PWM AMP | Refer to 5-5 |
| | 8. OP Lens motion | Visually Check (Refer to 3-5-12) |
| | 9. RF signal | Refer to 5-2-8 |
| | 10. Focus Servo Loop Gain | Refer to 5-2-7 |
| | 11. Tracking error Signal | Refer to 5-2-6 |
| | 12. Tracking Servo Loop Gain | Refer to 5-2-7 |
| | 13. Optical device Signal | Waveform Check (Refer to 3-5-12) |

| Test Items | Check Point | Remarks |
|---|--|---|
| | 14. Disc in/Disc Protection/ Reflection switch (Ref. no. S701/S702/S703) - Mech-Con PCB) | Refer to 3-5-3 |
| Re-Writable Disc Read capacity TOC read UTOOC Rezero Seek Read | 1. RF Signal | Refer to 5-2-8 |
| | 2. Tracking Servo Loop Gain | Refer to 5-2-7 |
| | 3. Optical device Signal | Waveform check (Refer to 3-5-13) |
| | | |
| Write/Verify | 1. LD Write Power | Refer to 5-2-3 |
| | 2. Optical Device Signal | Waveform check (Refer to 3-5-13) |
| | 3. APCREF, APC | Refer to 5-2-3 |
| | 4. Stepper | Refer to 3-5-17 |
| | 5. Temperature Detection | Refer to 5-2-2 |
| Error rate | 1. LD Write Power | Refer to 5-2-3 |
| | 2. Stepper | Refer to 3-5-17 |
| | 3. Focus Bias/RF Jitter | Refer to 5-3-8 |
| | 4. Motor Jitter | Refer to 5-6 |
| Audio Disc Audio Play | 1. Audio Output | Refer to 5-7 |

3-5 FUNCTION CHECK (OTHER THAN AUDIO BLOCK)

The following [flowchart 3-5](#) shows an example of a typical procedure to check a faulty unit and to identify defective part. Section No. is shown with each operation for the detailed procedure.

3-5-1 Pre-Setting

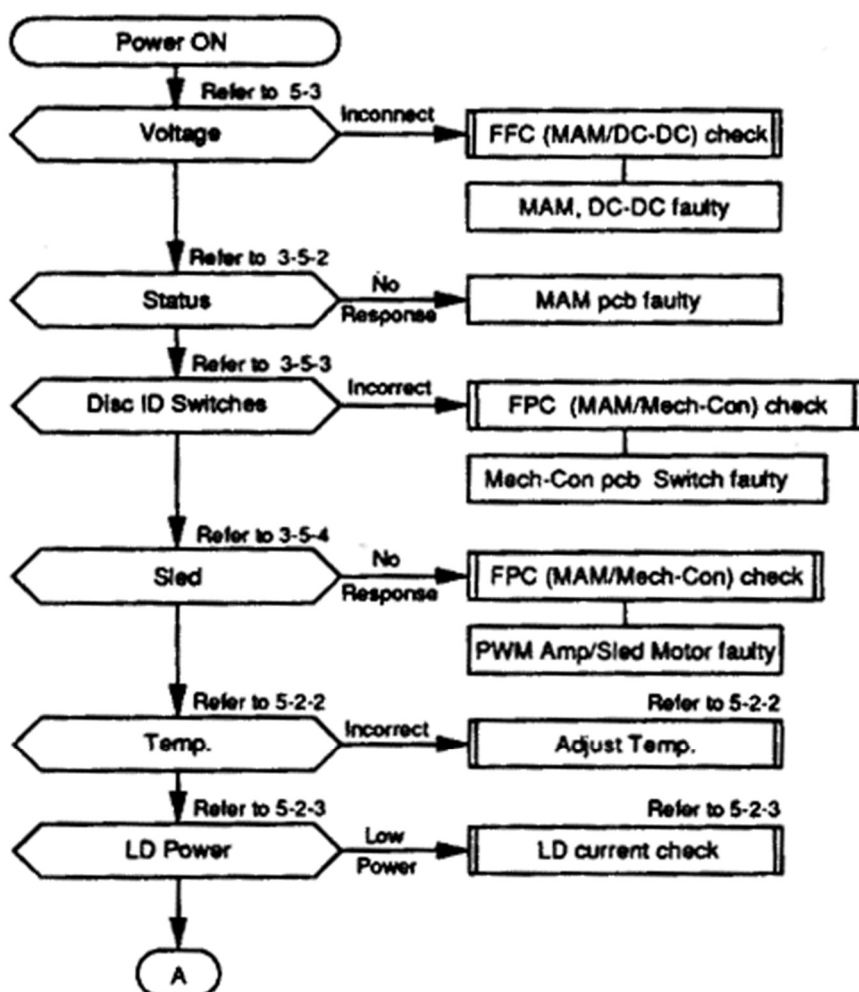
- Disassemble the following parts before connecting to the computer.
Upper Panel, Rear/Bottom Panel Ass'y (Refer to [4-1](#)) Ornamental Belt Ass'y (Refer to [4-2](#))
- Connect the unit to the host computer as shown in [Fig. 2-3-2](#).

Note: After connecting the unit to be tested, load TEST program in accordance with section [5-2-1](#).

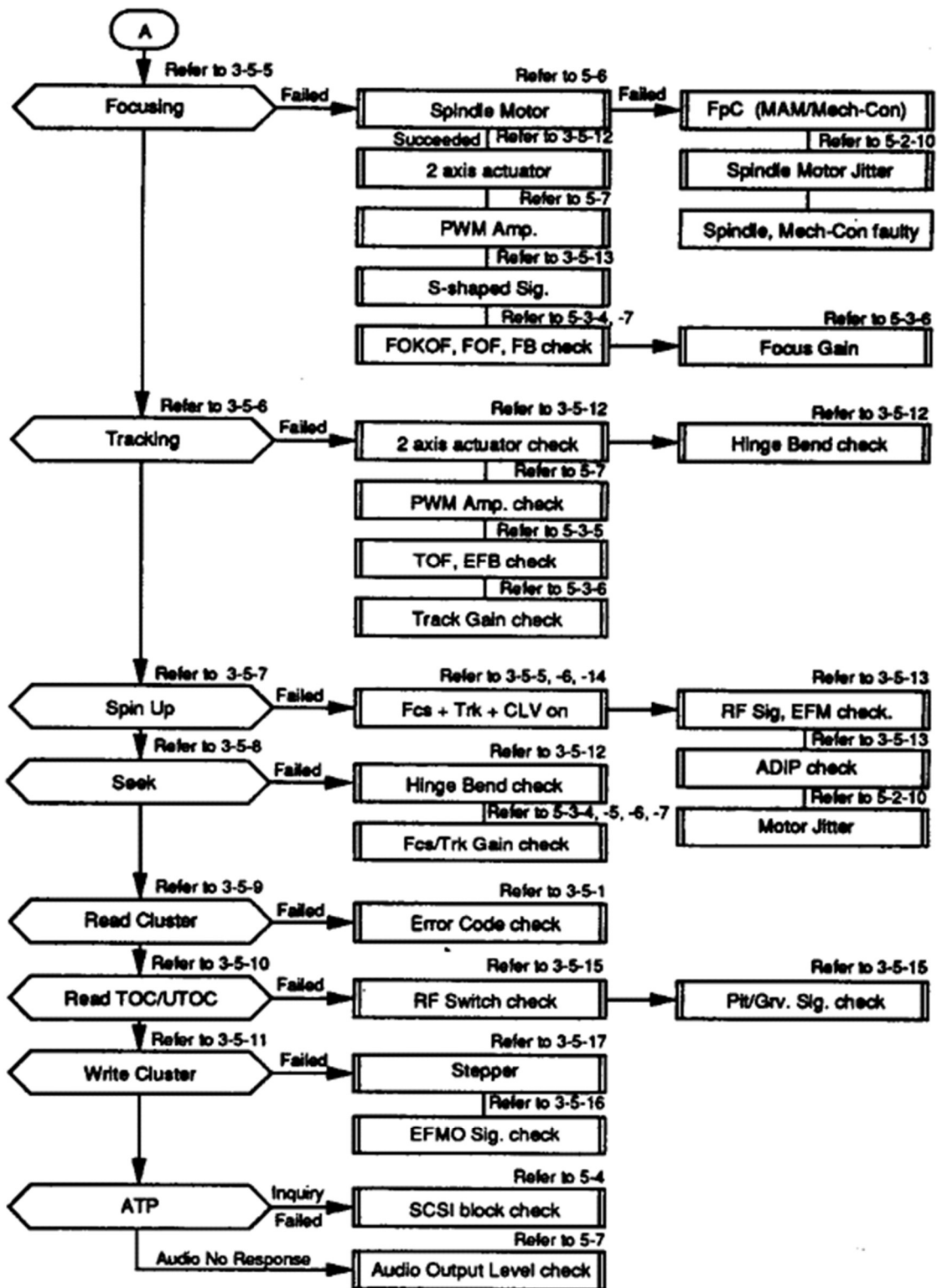
3-5-2 Status Check

- a. Execute **19: Drive Status** and check whether the unit respond normally.
- b. Type **s t s** and push **RETURN** to see the drive status information continuously on top of the screen.

Note: In case of no response from the unit, MAM Mounted Board is faulty.



Flowchart 3-5 Troubleshooting



Flowchart 3-5 Troubleshooting

3-5-3 Disc ID Switches

- Insert a Read Only Disc (TGYS-9001) into the drive.

- b. Check the drive status by **19: Drive Status** command or by indications on the status bar on top of the screen. Table below shows the normal status condition.
- c. Eject a Read Only Disc (TGYS-9001). Then insert a Re-Writable Adj. Disc with the disc protection closed (writable). Check the Status.
- d. Eject the disc from unit.

Note: If the status indication is wrong, switches on Mech-Con Mounted Board are faulty.

| | Status Bar | | | Drive Status 2 | | |
|-------------|------------|--------|-------|----------------|-------|-------|
| | XDSCIN | DSCPRT | RFLCT | bit 7 | bit 6 | bit 5 |
| No disc | on | on | on | 1 | 0 | 0 |
| Read-Only | off | on | off | 1 | 0 | 1 |
| Re-writable | off | off* | on | 0* | 1 | 0 |

* : Inverted if the disc is write protected.

Note: Never change the disc write protection while disc is in the unit. It will break the detection switch.

3-5-4 Sled Motor Check

- a. Execute **16: Step Out** command after setting parameter to **100** in parameter window. Check the Optical device moves to the other position.
- b. Execute **15: Step in** after setting parameter to **100** in parameter window. Check the Optical Device motion whether it is returned to the original position.

Note: If the Optical Device will not move, the Sled Motor or the driver IC (PWM AMP) faulty.

3-5-5 Focusing

- a. Check this procedure with both types of the disc by turns. Insert one of the discs. Move the Optical Device out by 100 steps with the **16: Step Out** command.
- b. Execute **13: Focus ON/OFF** command after setting **Byte 05** to **01** (01 means Focus on) in parameter window. The unit will spin the disc and try focus search and close the servo. Check whether the focus servo is on by the FOK indication (ON) in the status bar on top of the screen, or by **19: Drive Status** command with the Drive Status 1, bit 6 Focus (=1).

Note: If failed to focus, the Spindle Motor, the 2 axis actuator on the Optical Device, the driver (PWM amp.), the Focus offset and gain adjustment or the MAM mounted board is faulty.

3-5-6 Tracking

- a. After the Focus servo is on, execute **12: Tracking ON/OFF** after setting **Byte 05** to **01** (01 means Tracking on) in parameter window. The unit will close the Tracking servo. Check it by the LOCK indication (ON) in the status bar on top of the screen, or by **19: Drive Status** command with the Drive Status 1, bit 7 Tracking (=1) and 5 PLL (=1).

Note: If failed, the 2 axis actuator on the Optical device, the driver IC (PWM amp.), the Tracking offset and EF balance adjustment, gain adjustment, or the MAM mounted board is faulty.

3-5-7 Spin Up

- a. Execute **3: STOP** if Focusing or Tracking is on. Spin up the unit by executing **2: Spin Up** command. The unit will start spinning the disc, focusing, tracking and CLV control by turns. The FOK and the LOCK indication in the status bar on top of the screen will come on. If the disc is a Read Only Disc (TGYS-9001) or a Re-Writable Adj. Disc with normal data written, the GFS indication on the screen is also on.

Note: In case of failure, check the Return Code in byte 2 of the Return DATA on the screen. (Refer to [Quick Reference Manual](#) on page 5-4). Try Focusing (Refer to [3-5-5](#)), Tracking (Refer to [3-5-6](#)) and CLV ON (Refer to [3-5-14](#)) by turns. The problem may exist in the Optical Device, the RF signal process circuit on the MAM mounted board or in the Spindle Motor jitters.

3-5-8 Seek

- a. Execute **5: Seek** command to seek to any address. Check whether the drive can seek to near and far address, go outer and inner address. The cluster address range must be within the Read Out Start Address written in TOC (2252 clusters for any Re-Writable disc). Check the present address in the status bar on the screen.

Note: If failed, check the Optical device, Focus / Tracking offset and gain adjustment.

3-5-9 Read Cluster

- a. Be sure the disc in the unit contains normal data written at a known address range.
- b. After spinning up or seeking, execute **6: Read Cluster** command at the address with any data written. Check byte 2 Return code in the Return DATA on the screen. (Refer to [Quick Reference Manual](#) on page 5-4). Return code 00 means success. Any other code indicate failure. Refer to the Return code table for the reason.

3-5-10 Read TOC / UTOC

- a. Be sure the UTOC is written on the Re-Writable Adj. Disc in the drive. If not, format the disc.
- b. After spinning up or seeking, execute **7: Read TOC** command. The drive will seek to the Read-In area and read one TOC. Check byte 2 Return code in the Return DATA on the screen.
- c. Execute **8: Read UTOC** command. (Refer to [Quick Reference Manual](#) on page 5-4). Check the Return code.

Note: In case of failure, check the Pit/Grv. signal on MAM mounted board and sled motion at the inner most radius position.

3-5-11 Write Cluster

- a. Be sure the disc in the unit is re-writable and is not write protected. (note: Never change the disc write protection while disc is in the unit. It will break a detection

switch.) Recommend not using the standard test disc because the reference data written on the disc is destroyed in case of failure.

- b. After spinning up or seeking, execute **9: Write Cluster** command at any address between cluster **100** and the Read-Out Area start address. The address less than cluster **99** is normally used for the UTOC and the alternation clusters for defective area. Check byte 2 Return code in the Return DATA on the screen. (Refer to [Quick Reference Manual](#) on page 5-4).
- c. Execute **6: Read Cluster** command at the same address to verify the previous write operation. Check the Return code to be 00. (Refer to [Quick Reference Manual](#) on page 5-4).

Note: If failed to write a cluster, check Laser Power, EFMO signal, OWH and its driver IC.

3-5-12 2 Axis Actuator

- a. Eject a disc if it is in the unit. Look into the drive and find the objective lens on the Optical device. Execute **20: Reset** Command.
- b. Put **w&fffc7,fd** on cmd [xx] > line. (This will reset the power save mode.)
- c. Put **w80006,34** on cmd [xx] > line. (This will set focus search height.)
- d. Put **w80006,03** on cmd [xx] > line. Check the lens is moved up.
- e. Put **w80006,02** on cmd [xx] > line. Check the lens is moved down.
- f. Put **w80006,00** on cmd [xx] > line to stop the focus control.
- g. Put **w80006,28** on cmd [xx] > line. Check the lens is moved toward inner direction.
- h. Put **w80006,2c** on cmd [xx] > line. Check the lens is moved toward outer direction.
- i. Put **w80006,20** on cmd [xx] > line to stop the tracking control.

Note: If the lens will not be moved, check conductivity of the 2 axis actuator coils. (TP104 [F-] and TP101 [F+], TP103 [T+] and TP102 [T-]) The both coil resistance are $7.0 \pm 1.0 \Omega$. If the coils are normal, check the PWM amplifier (Refer to [5-5](#)).

Hinge Bend Check

- a. Remove the MAM Mounted Board. (Refer to [section 4](#))
- b. Visually check the Optical Device hinge from the bottom. Check the position of the lens holder (black mold part holding the lens and coils) relative to a prism mirror (matted glass part).

Note: If the hinge is bent, the Optical device has to be replaced.

3-5-13 Optical Device Signals

- a. **Focusing (S-shaped Signal)**

a-1.

Connect a probe of an oscilloscope (storage type recommended) to AP5070 [FE-O]. Set trigger DC coupling with 2.0V level, positive and normal.

a-2.

Insert a Re-Writable Adj. Disc. Move the Optical Device out by **100** steps with the **16: Step Out** command.

a-3.

Execute **13: Focus ON/OFF** command after setting **Byte 05** to **01** (01 means Focus on) in parameter window. The unit will spin the disc and try focus search and close the servo. Check whether the focus servo is on by the FOK indication (ON) in the status bar on the screen, or by **19: Drive Status** command with the Drive Status 1, bit 6 Focus (=1).

a-4.

Put **w80006,00** on cmd [xx] > line to stop the focus control.

a-5.

Put **w : fffd6,01** on cmd [xx] > line to set AGCTC (Auto Gain Control Time COnstant) short.

a-6.

Put **w80006,03** on cmd [xx] > line to move the Optical Device lens up. The oscilloscope may be triggered by a signal when the focal point cross the surface of the disc.

a-7.

Put **w80006,02** on cmd [xx] > line to move the Optical Device lens down. The oscilloscope is triggered by the S-shaped signal.

a-8.

Repeat item a-6. and a-7. for adjusting the oscilloscope setting to capture clear signal. Two S-shaped signals may be observed, one at the disc top surface and the other at the bottom. The first one is the true S-shaped signal.

Peak to peak voltage level of the S-shaped signal should be more than 2 Vp-p. If low, the Optical device is faulty.

a-9.

Execute **3: Stop** command before proceeding to other function check.

b. Tracking (Traverse Signal)

b-1.

Connect a probe of an oscilloscope to AP5060 [TE-O].

b-2.

Insert a Re-Writable Adj. Disc. Move the Optical Device out by **100** steps with the **16: Step Out** command.

b-3.

Execute **13: Focus ON/OFF** command after setting **Byte 05** to **01** (01 means Focus on) in parameter window.

b-4.

The oscilloscope shows the traverse signal; the tracking error signal while crossing over many tracks due to eccentricity of the disc (Refer to [5-2-5](#)). The peak to peak voltage level of the traverse signal should be more than 1.5 Vp-p. If low, the Optical device is faulty. Try replacing the Optical Device with new one and check the level again after adjustment in [section 5](#). If the level is still low, position alignment of the Spindle Motor is out of tolerance and the Mech. Deck has to be replaced. Spindle motor position is aligned only at factory with a dedicated facility.

c. RF and EFM (Read Data Signal)

c-1.

Connect a probe of a non-storage oscilloscope to AP5020 [RF].

c-2.

Insert a Read Only Disc (TGYS-9001) or a Re-Writable Adj. Disc with normal data written.

c-3.

Execute **5: Seek** with appropriate cluster address (50 for the standard test disc).

c-4.

Normal eye-pattern (RF Signal) should be observed (Refer to [5-2-7 display](#)). Probe at AP5090 [EFM]. The EFM signal is the digital read data into binary levels. The eye-pattern is not observed if no data is written in the area being read.

c-5.

If peak to peak voltage level of the RF signal is less than 0.5Vp-p, the Optical device or the APC (Auto Power Control) circuit on MAM mounted board is faulty.

c-6.

If low frequency jitters; shrinkage and expansion of the eye-pattern in time axis, is observed, spindle motor or its control is faulty. Check the motor jitters in [5-2-9](#).

c-7.

If high frequency noise or high frequency jitters (blurred line) is observed, 3.5-2V power line or the Optical device is faulty. Check voltage and noise on 3.5-2V line.

d. ADIP (Push-Pull or Wobble Signal)

d-1.

Connect a probe of an oscilloscope to AP5122 [ADIPFM].

d-2.

Insert a Re-Writable Adj. Disc.

d-3.

Execute **5: Seek** with appropriate cluster address (50 for the standard test disc).

d-4.

24.8khz sinusoidal waveform is observed. Because the signal is modulated with address data in FM, the modulation jitters are included. Peak to peak voltage level of the signal is around 0.4 Vp-p, but the amplitude varies due to influence from adjacent tracks. If the level is less than 0.2 Vp-p, the Optical Device is faulty.

3-5-14 CLV Control

- a. Follow the procedure in [3-5-5](#) and [3-5-6](#) to start focusing and tracking.
- b. Execute **21: CLV On/Off** command after setting **Byte 05** to **01** (means CLV control on). Check the LOCK indicator is on in the status bar on the screen or the PLL bit (bit 5) in the Drive Status 1 is 1 (high).

Note: If not, check RF signal and ADIP signal (Refer to [3-5-13](#)).

3-5-15 Disc Type and Tracking Mode Selection

- a. Insert a Re-Writable Adj. Disc. Move the Optical Device out by **100** steps with the **16: Step Out** command.
- b. Execute **13: Focus ON/OFF** command after setting **Byte 05** to **01** (01 means Focus on) in parameter window.
- c. Check both RFSW1 and RFSW0 are 0 (low) by the indication in the status bar on the screen or bit 0 and 1 in the Drive Status 2. The unit is in the low reflectivity (Re-Writable Adj.) disc and the groove mode.
- d. Execute **20 : Reset** command move the Optical Device to the TOC area or the inner most position.
- e. Check focus is still on by the FOK indication in the status bar. If not execute **13: Focus ON/OFF** command after setting **Byte 05** to **01**.
- f. Check RFSW1 is 1 (high) and RFSW0 is 0 (low). The unit is in the low reflectivity (Re-Writable Adj.) disc and the pit mode.
- g. Eject the Re-Writable Adj. Disc and insert a Read Only Disc (TGYS-9001).
- h. Execute **13: Focus ON/OFF** command after setting **Byte 05** to **01**.
- i. Check both RFSW1 and RFSW0 are 1 (high). The unit is in the high reflectivity (Read Only) disc and the pit mode.

Note: If the unit mode is incorrect, the pit/grv detection circuit in the MAM mounted board is faulty.

| | | RFSW1 | RFSW0 |
|----------------|-----|----------|----------|
| Read-Only disc | Pit | 1 (high) | 1 (high) |

| | | | |
|------------------|--------|----------|---------|
| Re-writable disc | Pit | 1 (high) | 0 (low) |
| Re-writable disc | Groove | 0 (low) | 0 (low) |

3-5-16 Write Signal

- Insert a Re-Writable Adj. Disc which is not write protected. (note: Never change the disc write protection while disc is in the unit. It will break a detection switch.) Recommend not using the standard test disc because the reference data written on the disc is destroyed in case of failure.
- After spinning up or seeking, execute **9: Write Cluster** command from cluster **100** for **255** clusters long. The write operation will continue for about 109 seconds.
- Probe the RECFM signal with a non-storage oscilloscope at TP8203. The waveform should be similar to that of the EFM signal in [section 3-5-13](#) item c. If not, IC701 EFM Enc/Dec. on MAM mounted board is faulty.
- Check the OWH drive signal according to the procedure in [section 5-3](#). If wave form is not normal, check conductance of the magnetic head. The resistance is $1.7 \pm 0.3 \Omega$.

3-5-17 Stepper Motor

- The stepper motor is used to lock the eject mechanism during read or write operation, also to move the OWH down/up.
- Execute **9: Write Cluster** command. Visually check the OWH is moved down on the surface of the disc before write operation starts, and is moved up at the end.

Note: If failed, check stepper motor and its drive IC.

SECTION 4

PARTS REPLACEMENT

4-1 UPPER PANEL AND REAR/BOTTOM PANEL ASS'Y REPLACEMENT

- Remove the six screws (M1.4x2.5 Special Head/black) securing the Upper Panel and Rear Panel Ass'y. They are taken away. (Refer to Fig. 4-1)
- Remove the five screws (M1.4x2.5 Special Head/black) securing the Bottom Panel Ass'y. It is taken away. (Refer to Fig. 4-1)

Note: When installing, secure it with torque force of 9.8N·cm (1kgf·cm).

Note: When replacing the Rear Panel Ass'y, be sure to attach the protection sheet (Terminal).

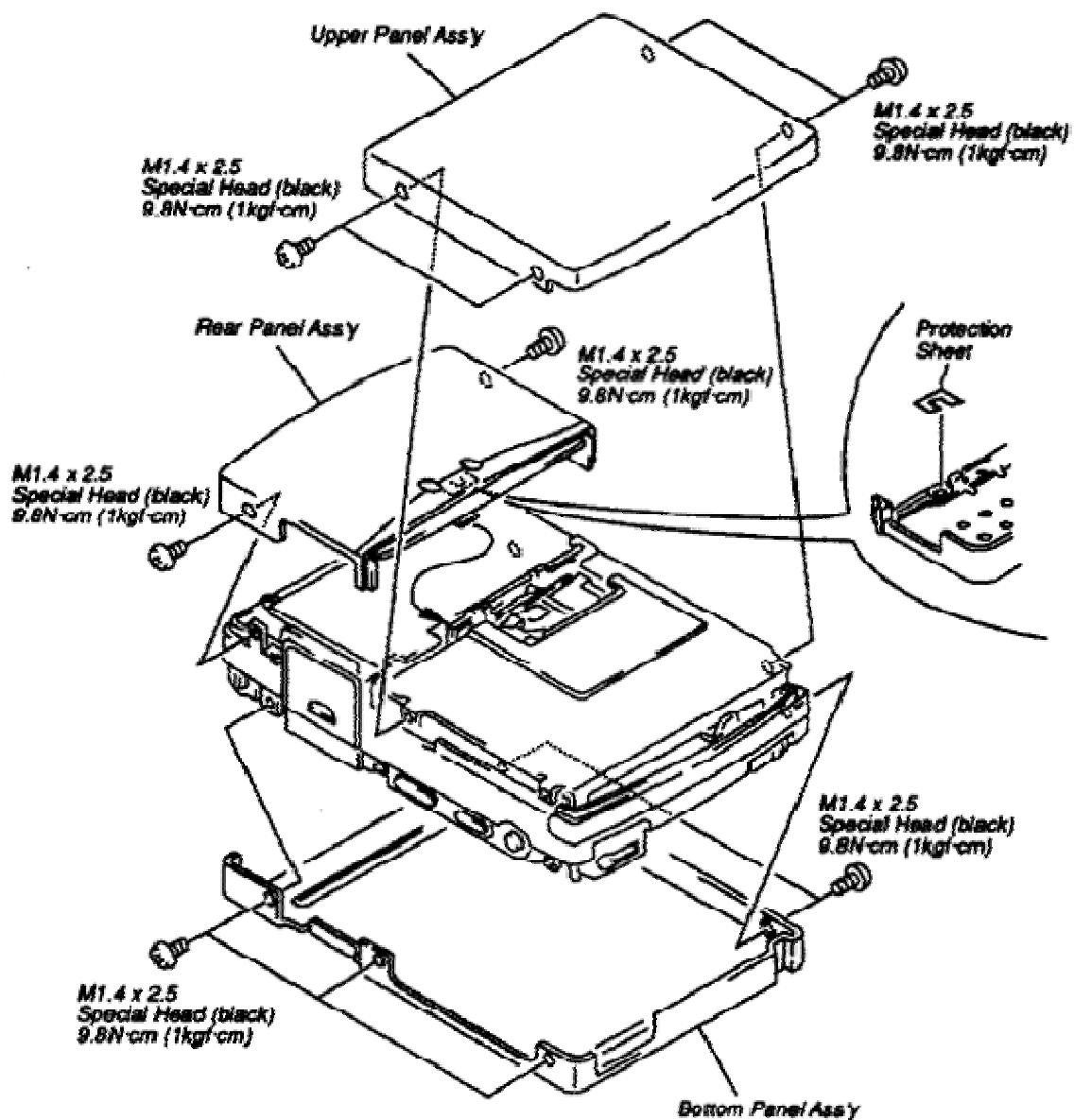


Fig. 4-1 Upper Panel and Rear/Bottom Panel Ass'y Replacement

4-2 ORNAMENTAL BELT ASS'Y REPLACEMENT

- a. Spread out Ornamental Belt Ass'y and dislocated it from the frame. (Refer to Fig. 4-2)

Note: When Installing, follow next steps.

- ❶ Carefully attach front portion to the unit so that OPEN switch knob is located in proper position and works smoothly.
- ❷ Slide in left, portion to the unit so that a hook on the left side is fit to the frame.
- ❸ During spread out rear portion, attach it.
- ❹ Attach right portion so that POWER OFF and AVLS switches knob are located in proper position and works smoothly.

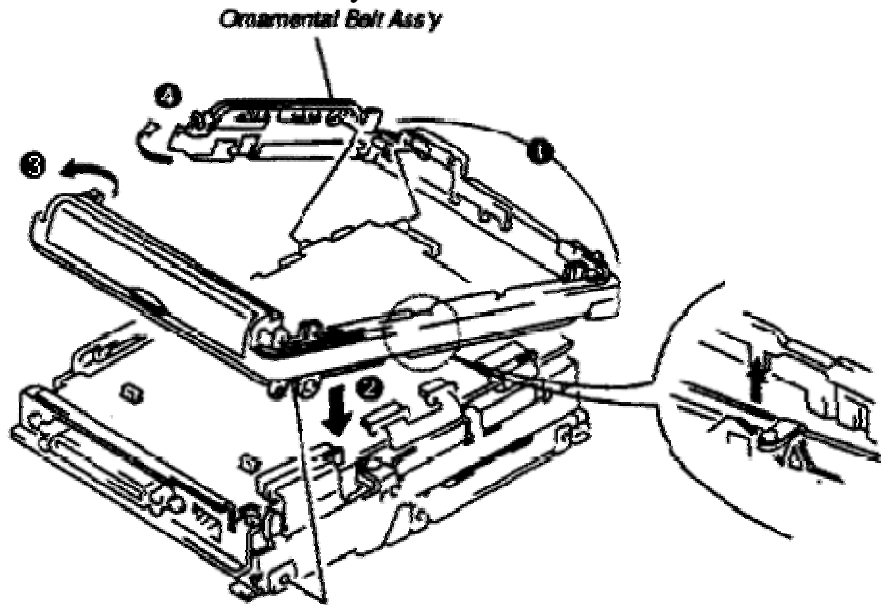


Fig. 4-2

4-3 CONNECTOR PLATE REPLACEMENT

- a. Remove the two screws (P2.6x6/black or P2.5x6/light gold) and two screws (M1.4x2.5 Special Head/black) securing the Connector Plate to the MAM Mounted Board. (Refer to Fig. 4-3)

Note: When installing, secure screw (P2.6x6/black or P2.5x6 light gold) with torque force of 44.1N·cm (4.5kgf·cm) and screw (M1.4x2.5 Special Head/black) with torque force of 9.8N·cm (1kgf·cm).

4-4 MAM MOUNTED BOARD REPLACEMENT

Note: When the MAM Mounted Board is replaced with new one, perform the program downloading in accordance with [5-8](#) before the adjustment.

- a. Disconnect the flexible cable from the CN501 connector (for Optical ass'y).

Note: When disconnecting (connecting) from (to) CN501 connector, make a solder bridge on the laser tap of the flexible board, as the laser diode in the optical pickup is easily damaged by static electricity.

- b. Unlock the CN801, CN802 and CN803 as shown in Fig. 4-3 and disconnect all the flexible cables (CN801 for DC-DC converter, CN802 for REC mounted board ass'y, CN803 for mech con mounted board ass'y)
- c. Remove the four screws (M1.4x2 Toothed Lock/light gold) securing the MAM Mounted Board to the frame. (Refer to Fig. 4-3)

Note: When installing, secure it with torque force of 9.8N·cm (1kgf·cm).

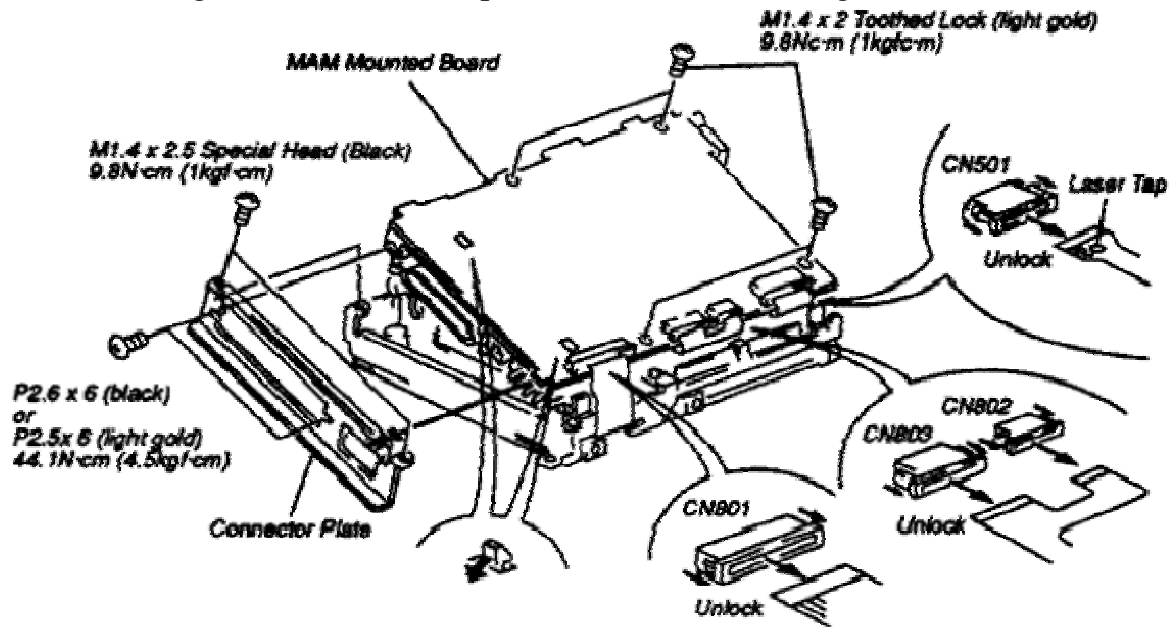


Fig. 4-3 Connector Plate and MAM Mounted Board Replacement

4-5 DC-DC CONVERTER REPLACEMENT

- a. Remove the two screws (M1.4x2 Toothed Lock/silver) securing the DC-DC Converter to the Battery Case Ass'y. (Refer to Fig. 4-5)
- b. Desolder the power line connected the Battery Case Ass'y on the DC-DC Converter. They can be separated from each other. (Refer to Fig. 4-5)

Note: When installing, secure it with torque force of 9.8N·cm (1kgf·cm).

4-6 MECHANICAL DECK (MECH DECK) COVER ASS'Y REPLACEMENT

Note: After the removal of the Mech Deck Cover Ass'y, do not apply excessive force to the Head arm or Head own because Head arm is easily damaged.

- a. Remove the two screws (M1.4x2.5 Special Head/black) securing the Mech Deck Cover Ass'y and then stand up the Mech Deck Cover Ass'y vertically and pull it forward toward you. (Refer to Fig. 4-6)

Note: When installing, secure it with

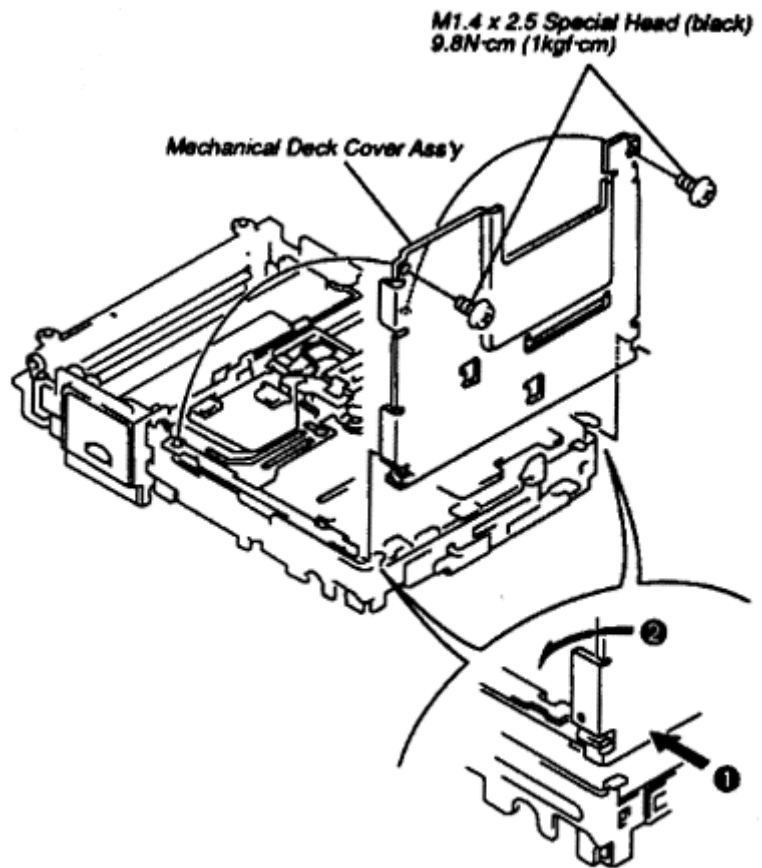


Fig. 4-6 Mech Deck Cover Ass'y Replacement
torque force of 9.8N·cm (1kgf·cm).

4-7 FRONT/REAR FRAME ASS'Y, BATTERY CASE ASS'Y AND MECH DECK REPLACEMENT

- a. Remove the four screws (damper/light gold) securing the Front/Rear Frame Ass'y and take out Mech Deck. (Refer to Fig. 4-7(a))

Note: When installing, secure it with torque force of 4.9N·cm (0.5kgf·cm).

Note: Push the lever on the Mech Deck and dislocate it from the opening on the Front Frame Ass'y. At the same time take out the Mech Deck.

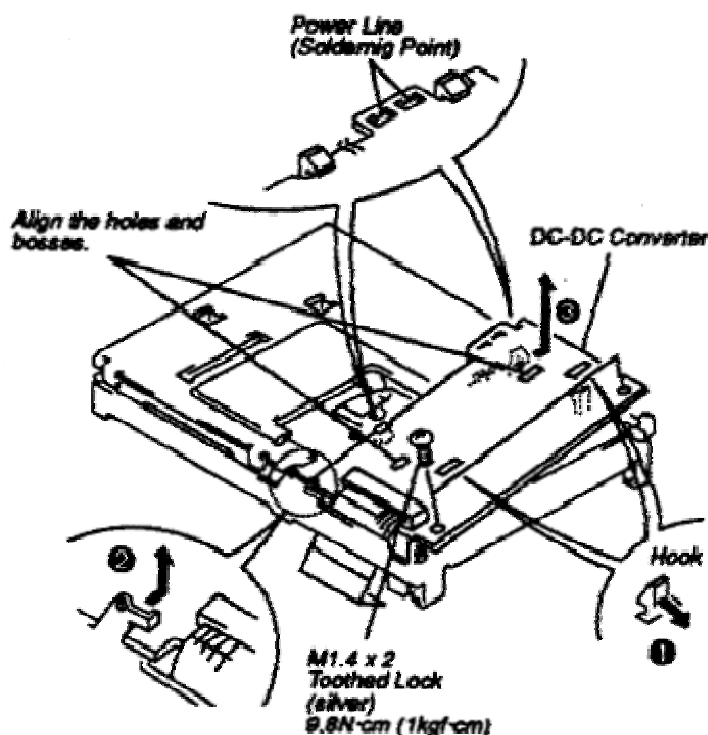


Fig. 4-5 DC-DC Converter Replacement

Special Head/black) securing the Rear Frame Ass'y and take out Front Frame Ass'y. (Refer to Fig. 4-7(b))

- b. Remove the three screws (M1.4x2.5

Note: When installing, match the two bosses on the Front Frame Ass'y to two openings on the Rear Frame Ass'y.

Note: When installing, secure it with torque force of 9.8N·cm (1kgf·cm).

- c. Remove the two screws (M1.4x2.5 Special Head/black) securing the Battery Case Ass'y.
(Refer to Fig. 4-7(b))

Note: When installing, secure it with torque force of 9.8N·cm (1kgf·cm).

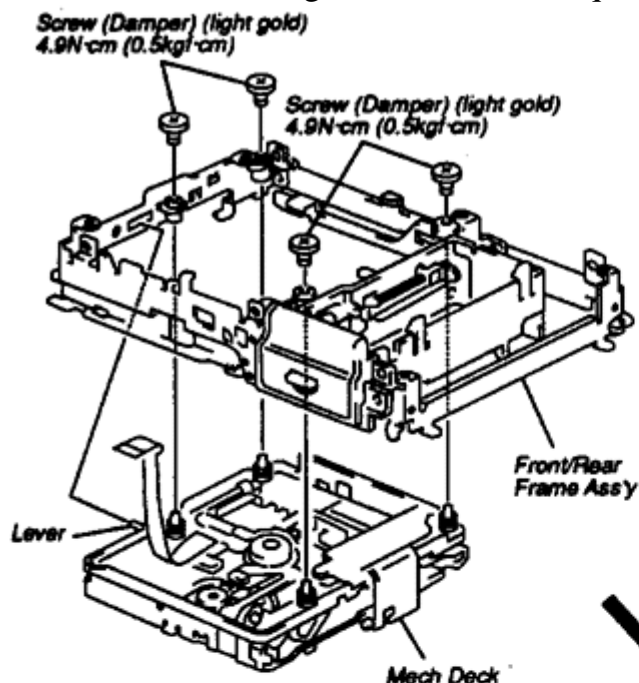


Fig. 4-7 (a) Mech Deck Replacement

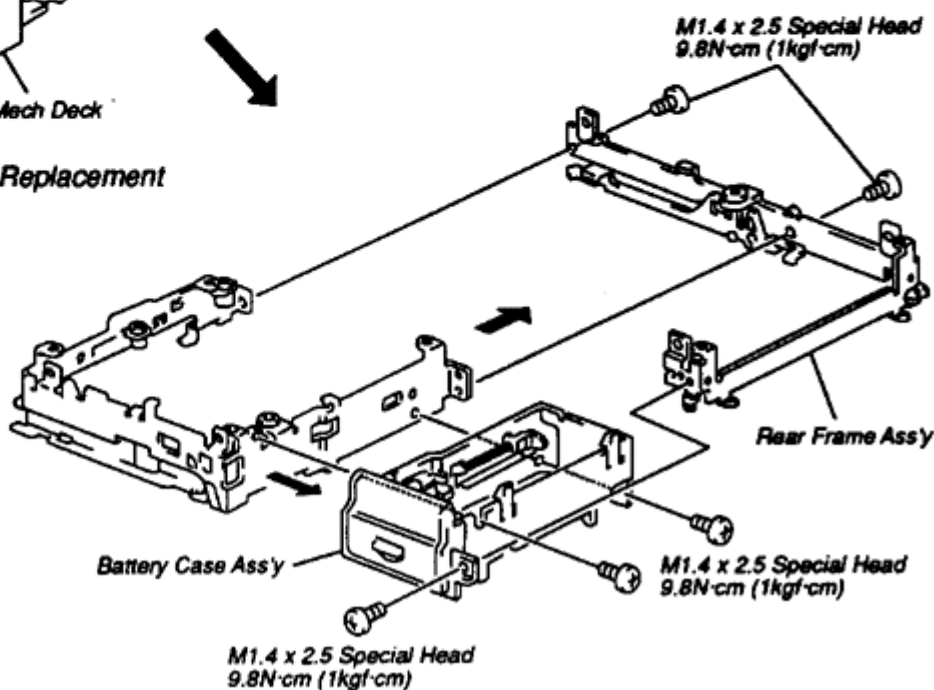


Fig. 4-7 (b) Front/Rear Panel Ass'y Replacement

4-8 COMPONENTS ON MECHANICAL DECK (MECH DECK) REPLACEMENT

Note: Through the removal (installtion) of Mech Deck, we recommend it to put on Mech Deck Base (J-905-914-0A).

4-8-1 REC Flexible Cable and MD Flexible Cable

- a. Disconnect the REC Flexible Cable from CN901 connector (for REC mounted board) and then carefully peel it off from MD Flexible Cable. (Refer to 4-8(a))

Note: When installing, peel off the paper on the MD Flexible Cable. Attach REC Flexible Cable on the MD Flexible Cable.

- b. Disconnect the MD Flexible Cable from CN901 connector (for Mech Con mounted board) and then peel off the MD Flexible Cable from the Mech Deck. (Refer to 4-8(a))

Note: When installing, peel off the paper on the MD Flexible Cable. Attach REC Flexible Cable on the Sled Motor Block Ass'y.

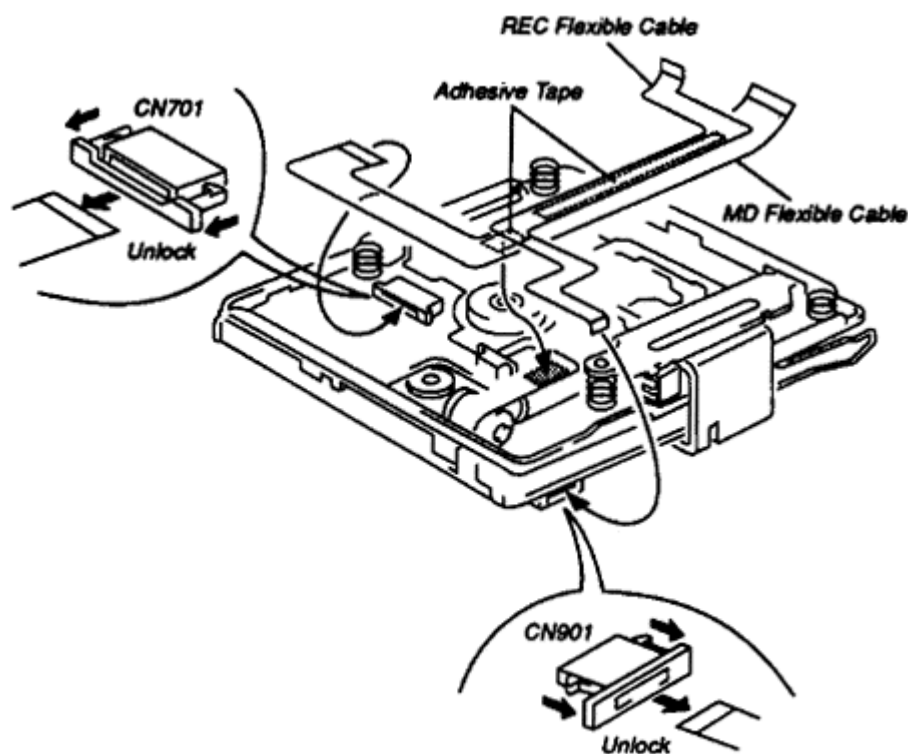


Fig. 4-8 (a) REC/MD Flexible Cable Replacement

4-8-2 OP Head Ass'y

Note: Through the installation (removal) of OP Head Ass'y, do not apply excessive force to the Head arm or Head own because Head arm is easily damaged.

Note: When the OP Head Ass'y replaced with new one, certainly attach the Cover Sheet and Pack Insulation Sheet as shown in Fig. 4-8(c).

- a. Remove the screw (P1.4x1.4/black) securing the head guard and remove the screw (P1.4x1.4/black) securing the under guard. They can be taken away. (Refer to Fig. 4-8(b))

Note: When installing, secure it with torque force of 7.8N·cm (0.8kgf·cm).

- b. Disconnect the flexible cable from CN902 connector (for REC mounted board).
- c. Remove the two screws (P1.4x3/black) securing the shaft (guide A) and remove the OP Head Ass'y backwards while lifting head arm. (Refer to Fig. 4-8(c))

Note: When installing, secure it with torque force of 7.8N·cm (0.8kgf·cm).

Note: Before installing, apply Sankol Grease (FG-84M) to the Lead Screw and the shaft (guide B). (Refer to Fig. 4-8(c))

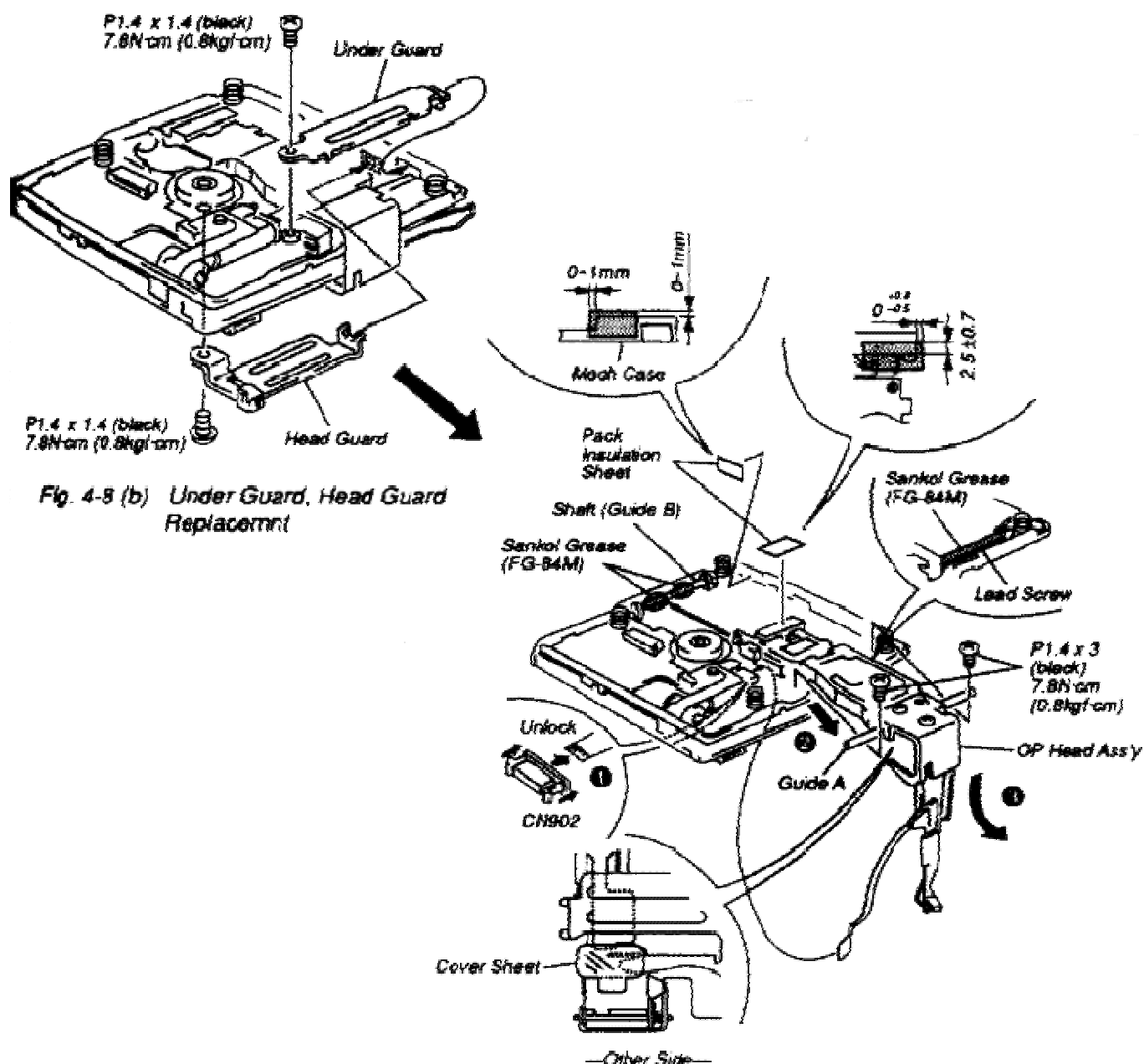


Fig. 4-8 (c) OP Head Ass'y Replacement and Grease Application Location

4-8-3 Gear (Worm Wheel) and Mechanical Compartment (Mech Con) Mounted Board

- a. Remove the Washer from shaft with Tweezers and then pull the Gear (Worm Wheel) up. (Refer to Fig. 4-8(d))

Note: Before installing, apply Diamond Oil (NT-68) to the chassis. (Refer to Fig. 4-8(d))

Note: When attaching the Gear (Worm Wheel), while pulling the lever direction marked with arrow 1, install it.

- b. Disconnect the flexible cable from CN702 connector (for Stepper Motor).
- c. Desolder CLV flexible cable on the Mech Con Mounted Board and flexible cable of sled motor with soldering iron.
- d. Remove the three screws (P1.4x1.4/black) securing the Mech Con Mounted Board and then remove the Mech Con Mounted Board. (Refer to Fig. 4-8(d))

Note: When installing, secure it with torque force of 9.8N·cm (1kgf·cm).

Note: Before installing, apply Sankol Grease (FG-84M) to the Lever (operating) Ass'y. (Refer to Fig. 4-8(d))

Note: When installing the Mech Con Mounted Board, while pushing lever direction marked with arrow 4, install it.

4-8-4 Motor

- a. Remove the three screws (P1.7x1.6/black) securing the Motor and then pull it straight up. (Refer to Fig. 4-8(d))

Note: When installing, secure it with torque force of 9.8N·cm (1kgf·cm).

Note: When the Motor is replaced with new one, certainly attach the cushion on the Motor.

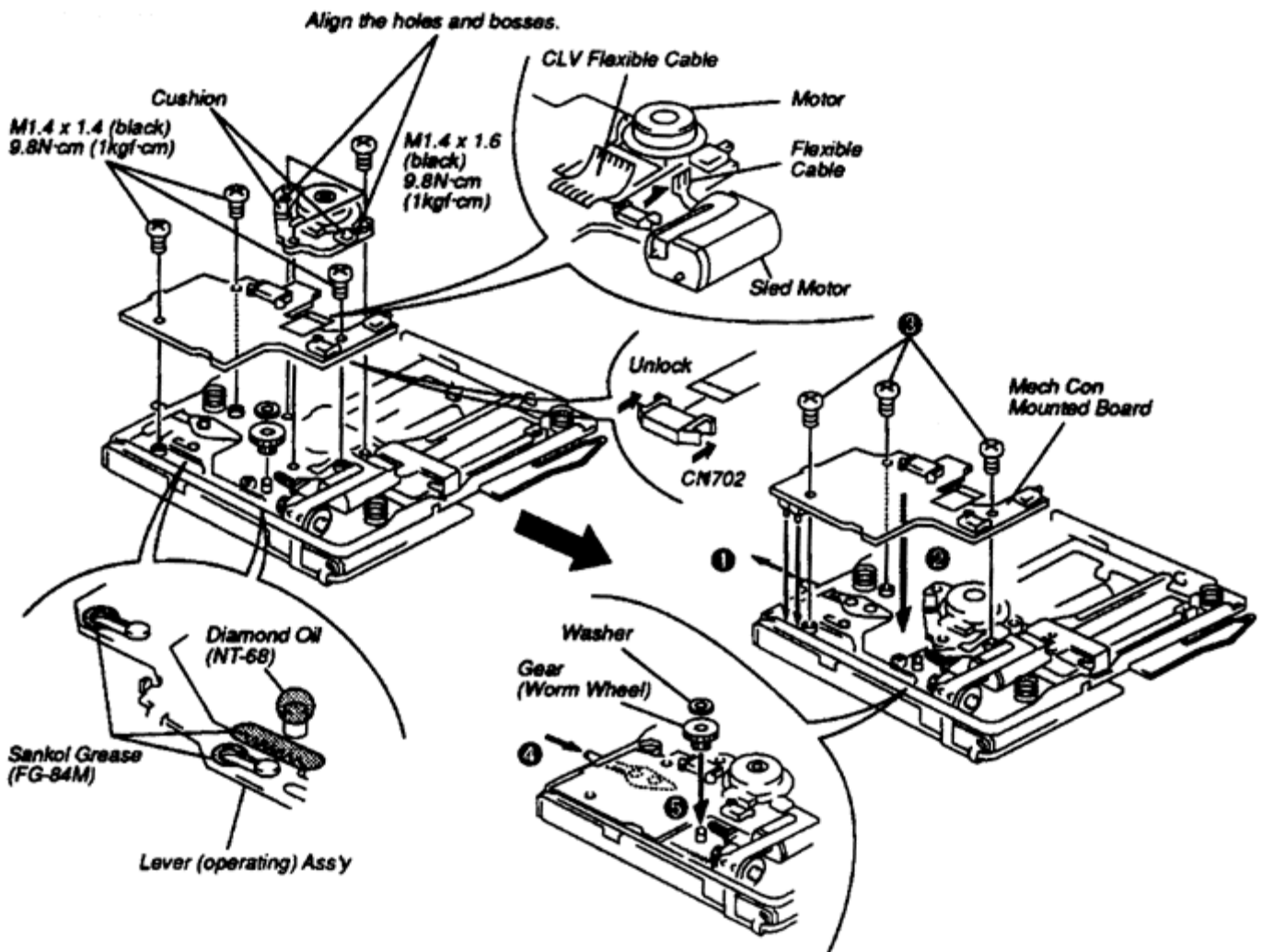


Fig. 4-8 (d) Mech Con Mounted Board Replacement and Oil/Grease Application Location

4-8-5 Gear Chassis Block Ass'y

- a. Remove the two screws (P1.7x1.6/black) securing the Gear Chassis Block Ass'y and then remove the Gear Chassis Block Ass'y. (Refer to Fig. 4-8(e))

Note: When installing, secure it with torque force of 9.8N·cm (1kgf·cm).

- b. Remove the Stopper Washer from the shaft with Tweezers and then pull the Worm Gear and Compression Spring up. (Refer to Fig. 4-8(e))

Note: Before installing, apply Diamond Oil (NT-68) to the shaft of Gear Chassis Block Ass'y. (Refer to Fig. 4-8(e))

- c. Remove the two screws (P1.2x1.6/black) securing the Stepper Block Ass'y and then remove the Stepper Block Ass'y. (Refer to Fig. 4-8(e))

Note: When installing, secure it with torque force of 8N·cm (.6kgf·cm).

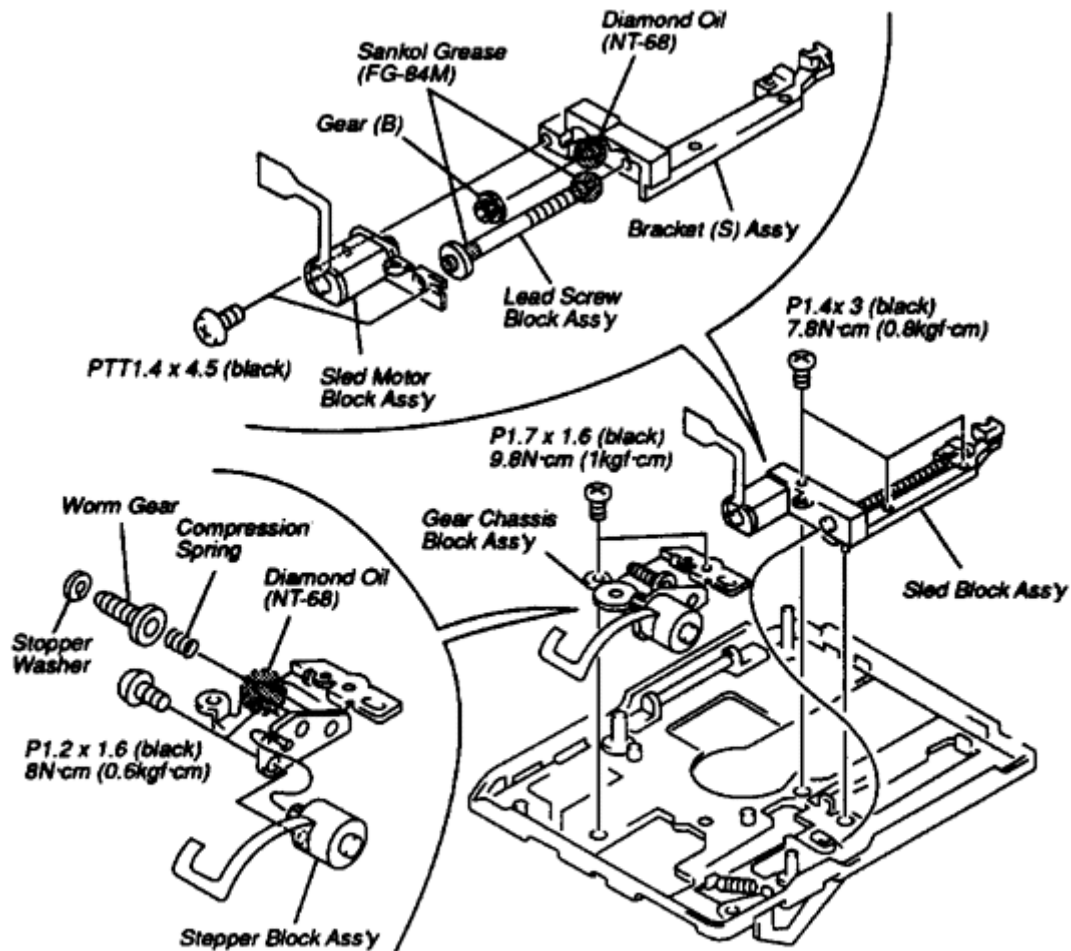
4-8-6 Sled Motor Block Ass'y

- Remove the three screws (P1.4x3/black) securing the Bracket (S) Ass'y and then remove the Bracket (S) Ass'y. (Refer to Fig. 4-8(e))

Note: When installing, secure it with torque force of 7.8N·cm (0.8kgf·cm).

- Remove the two screws (P1.4x4.5/black) securing the Sled Block Ass'y can be taken away the Sled Motor Block Ass'y, Lead Screw Block Ass'y, and Gear (B). (Refer to Fig. 4-8(e))

Note: Before installing, apply Diamond Oil (NT-68) to the shaft Bracket (S) Ass'y and apply Sankol Grease (FG-84M) to the Lead Screw Block Ass'y. (Refer to Fig. 4-8(e))



Fli. 4-8 (e) Gear Chassis/Sled Motor Block Ass'y Replacement

4-8-7 Holder Ass'y

- Remove the screw (M1.4x1.6 Special Head/black) securing the Holder Ass'y. (Refer to Fig. 4-8(f))

Note: When installing, secure it with torque force of 7.8N·cm (0.8kgf·cm).

- b. Remove the Stopper Washer located right rear of the Mech Deck from the shaft with Tweezers and then shift it left side and it can be taken away. (Refer to Fig. 4-8(f))

4-8-8 REC Mounted Board Ass'y

- a. Remove the screw (M1.4x1.4 Special Head/black) securing the REC Mounted Board Ass'y. (Refer to Fig. 4-8(f))

Note: When installing, secure it with torque force of 7.8N·cm (0.8kgf·cm).

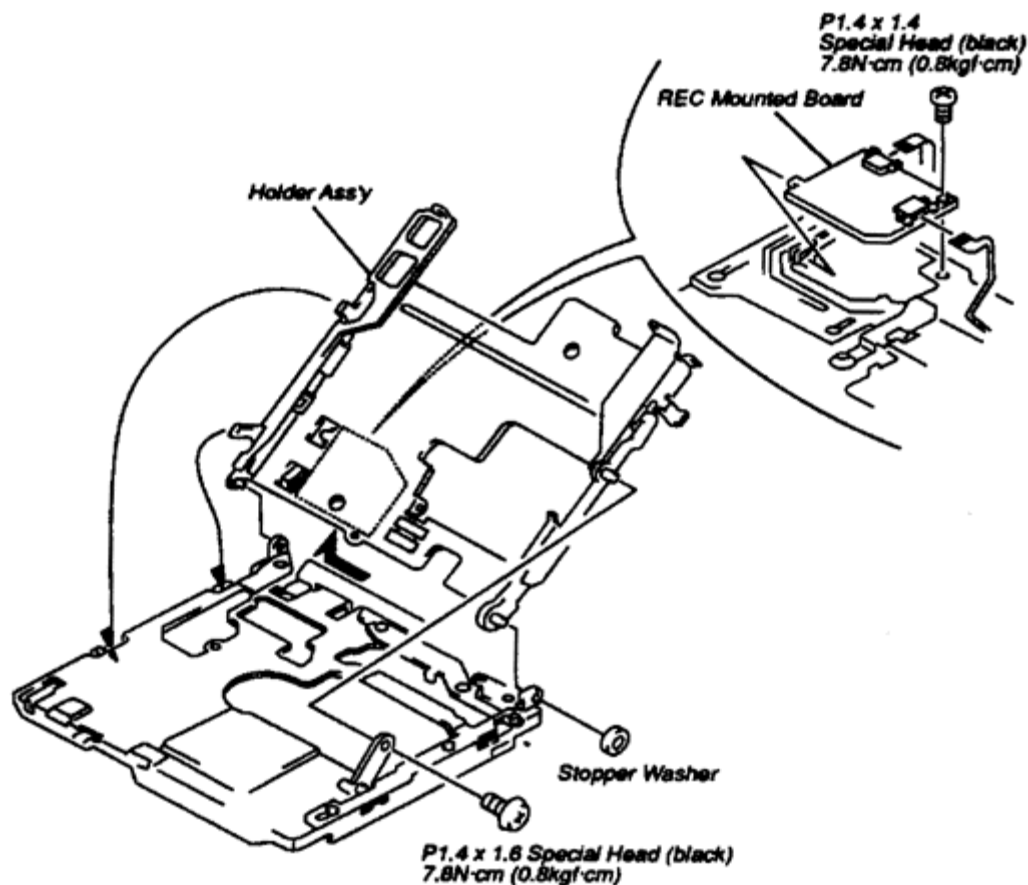


Fig. 4-8 (f) Holder Ass'y and REC Mounted Board Replacement

SECTION 5

ADJUSTMENT, MEASUREMENT AND CHECK

5-1 BEFORE ADJUSTMENT AND MEASURING

After defective part (s) (found out in section 3) replacement, perform adjustment, measurement, check in accordance with following table.

ex.) When O/W Head Ass'y with Optical Device is replaced, perform specified adjustment, measurement, and/or check marked with X.

| Part Adjustment, Measurement, Check | any part on Mech Dech | O/W Head Ass'y with OP | MAM Board | IC (s) for Power Line | Digital IC | Servo Circuit | Firm ware/ROM | Remarks |
|---|-----------------------|------------------------|-----------|-----------------------|------------|---------------|---------------|---------|
| TEMP Compensation (Refer to 5-2-2) | | | X | | X | X | | |
| Laser Power Adjustment (Refer to 5-2-3) | X | X | X | | X | X | | |
| Focus Offset Adjustment (Refer to 5-2-4) | X | X | X | | | X | | |
| EF Phase Difference Check (Refer to 5-2-5) | X | | | | | | | |
| Tracking Offset Adjustment (Refer to 5-2-6) | X | X | X | | | X | | |
| Gain Adjustment (Refer to 5-2-7) | X | X | X | | | X | | |
| RF adjustment (Refer to 5-2-8) | X | X | X | | | X | | |
| Error Rate Measurement (Refer to 5-2-9) | X | X | X | | X | X | | |
| Motor Jitter Measurement (Refer to 5-2-10) | X | X | X | | X | X | | |
| Voltage Output Measurement (Refer to 5-3) | | | | X | | | | |
| CPU Digital Check (Refer to 5-4) | | | X | | | | | |
| PWM AMP Check (Refer to 5-5) | | | | | X | X | | |
| Spindle Motor Check (Refer to 5-6) | X | | X | | | | | |
| Audio Output Level Check (Refer to 5-7) | | | X | | | | | |
| Down Load Program (Refer to 5-8) | | | X | | | | X | |

5-2 ELECTRICAL ADJUSTMENT

Disassemble the following part (s) and perform the following adjustment.

- Upper Panel, Rear/Bottom Panel Ass'y (Refer to 4-1)
- Ornamental Belt Ass'y (Refer to 4-2)

5-2-1 Pre-Setting

- Set the switches on the unit as below.
POWER Mode Select : DATA
Others : don't care
- Connect the unit to the host computer through a serial port as shown in Fig. 2-3-2. (No need to connect the AC adapter.)
- Turn on the unit and the Computer.
- After system loading, insert Function Test system disk (OR-D706WA) into the drive A.
- Change directory in the drive A.

- Type execution file name **TEST** and hit **Enter** key to start the following adjustment or measurement. (After test program loading, Menu bar will be displayed on the screen.)

Note: Hitting **Enter** key stands for setting any parameter in the any parameter window, or execution of any command in any menu. Also any parameter (command) can be selected with Up / Down arrow keys. Therefore, followings are described only simplified procedure command execution. Hit **Shift**, **Ctrl**, **ALT** key at the same time, when the program is hung up during any adjustment.

- Only **2 Host** command in Menu Bar is used through the adjustment.

g.-1 In case **2 Host** is selected by hitting **F2** key in Menu bar, Drive Control Menu shows up.

1 Func. 2 Host 3 Call 4 RdTrk 5 Hist. 6 Load 7 Help 8 Exit

Menu Bar

| Drive Control | | |
|---------------------|----------------------|-----------------------|
| 01 : Switch Control | 11 : Audio Rec | 21 : CLV On/Off |
| 02 : Spin Up | 12 : Tracking ON/OFF | 22 : Read Memory |
| 03 : Stop | 13 : Focus ON/OFF | 23 : Write Memory |
| 04 : FG Servo | 14 : Power Control | 24 : Write Address |
| 05 : Seek | 15 : Step In | 25 : Seek & Still |
| 06 : Read Cluster | 16 : Step Out | 26 : Laser Power Adj. |
| 07 : Read TOC | 17 : Read A/D Data | 27 : A/D Load |
| 08 : Read UTOC | 18 : Eject | 28 : RF/Servo Adj. |
| 09 : Write Cluster | 19 : Drive Status | |
| 10 : Audio Play | 20 : Reset | |

Drive Control Menu

Quick Reference Manual

This section shows each part detailed information of the screen/window/line on Function check software for your reference.

1. Serial Command (Serial command from host computer to drive under test (9Bytes))

Following Table 1 shows specified data for each byte on serial command.

| Special Command | Command | byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 |
|--------------------------------------|---------|--------|--------|--------|--------|--------|--------|--------|----------|--------|
| Switch Control | 01 | h'01 | h'10 | * | * | * | SW | | | |
| Spin Up | 02 | h'01 | h'11 | * | * | * | * | | | |
| Stop | 03 | h'01 | h'12 | * | * | * | * | | | |
| PG Servo | 04 | h'01 | h'13 | CI (H) | CI (L) | Sec | * | | | |
| Seek | 05 | h'01 | h'14 | CI (H) | CI (L) | Sec | * | | | |
| Read Cluster | 06 | h'01 | h'15 | CI (H) | CI (L) | * | CLen | | | |
| Read TOC | 07 | h'01 | h'16 | * | * | * | * | | | |
| Read UTOC | 08 | h'01 | h'17 | * | * | * | * | | | |
| Write Cluster | 09 | h'01 | h'18 | CI (H) | CI (L) | * | CLen | | | |
| Audio Play | 10 | h'01 | h'19 | Tr (H) | Tr (L) | * | TLen | | | |
| Reserved | 11 | h'01 | h'1a | * | * | * | * | | | |
| Tracking ON / OFF | 12 | h'01 | h'1b | * | * | * | SW | | | |
| Focus ON / OFF | 13 | h'01 | h'1c | * | * | * | SW | | | |
| Laser Power Control | 14 | h'01 | h'1d | * | * | * | PC | | | |
| Step IN | 15 | h'01 | h'1e | * | * | * | STEP | | | |
| Step OUT | 16 | h'01 | h'1f | * | * | * | STEP | | | |
| Read A / D Data | 17 | h'01 | h'20 | * | * | * | CH | | | |
| Eject | 18 | h'01 | h'21 | * | * | * | * | | | |
| Read Drive Status | 19 | h'01 | h'22 | * | * | * | * | | | |
| Reset | 20 | h'01 | h'23 | * | * | * | * | | | |
| CLV ON / OFF | 21 | h'01 | h'24 | * | * | * | SW | | | |
| Read Memory | 22 | h'01 | h'25 | * | * | * | * | | | |
| Write Memory | 23 | h'01 | h'26 | Ma (H) | Ma (L) | * | Data | | | |
| Read Address | 24 | h'01 | h'27 | Ma (H) | Ma (L) | * | * | | | |
| Seek & Still | 25 | h'01 | h'28 | * | * | * | * | | | |
| Laser Power Adj (Refer to item 3) | 26 | h'01 | h'50 | * | * | * | Data | Dir | Mode | |
| A/D Load (Refer to item 4) | 27 | h'01 | h'51 | * | * | * | Data | Item | Mode | Ope |
| RF/Servo Adj (Refer to item 5) | 28 | h'01 | h'52 | * | * | * | Data | Item | Dir/Mode | |

Table 1

* : Don't Care
 < blank > : Reserved
 CI (H) : Cluster Number (High Byte)
 CI (L) : Cluster Number (Low Byte)
 Sec : Sector Number
 SG : Sound Group Number
 Tr (H) : Track Number (High Byte)

Tr (L) : Track Number (Low Byte)
 TLen : Track Length
 CLen : Cluster Length
 SLen : Sector Length
 Ma (H) : Memory Address (High Byte)
 Ma (L) : Memory Address (Low Byte)
 Data : Write Data

2. Return Data (Return Data from drive to host (7Bytes))

Followings (Table 2, 3 and 4) shows return data from unit under test to host computer and are obtained on cmd [xx] > line.

| Return DATA | byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 |
|-------------|--------|--------------|-------------|----------------|----------------|--------|--------|
| | h'01 | Command Code | Return Code | Drive Status 1 | Drive Status 2 | | |

Table 2 Return Data

| | bit 7 | bit 6 | bit 5 | bit 4 | bit 3 | bit 2 | bit 1 | bit 0 |
|----------------|-----------|-----------|-------|-------------|---------|-------|-------|-------|
| Drive Status 1 | Tracking | Focus | PLL | Laser Power | | | | |
| Drive Status 2 | W Protect | Disc type | | | Spindle | | RFSW1 | RFSW0 |

Table 3 Drive Status

| Code | Description | Code | Description |
|------|-------------------|------|-----------------|
| 00H | Normal End | 01H | Invalid Command |
| 02H | No Disk | 03H | Write Protect |
| 04H | Focus Failure | 05H | Spindle Failure |
| 06H | Tracking Failure | 07H | FG Failure |
| 08H | Address Not Found | 09H | Address Failure |
| 0aH | C2PO Error | 0bH | Eject Error |
| 0cH | Disk Error | 0dH | Time Out |
| 0eH | Disk Not Spin Up | 0fH | |

Table 4 Return Code

3. Laser Power Adj. Command

Byte 6 and 7 are defined as below.

26 : Laser Power Adj.

| | |
|------------------------------|---|
| byte 6 (Direction) | 0 : EEPROM → Host 1 : Host → EEPROM 2 : Host → EVR/DA |
| byte 7 (Laser Power Mode) | 0 : CD Read 1 : MO Read 2 : MO Write |

Table 5

4. A/D Load Command

Byte 6, 7, 8 are defined as below.

27 : A/D Load

| | |
|------------------------------|---|
| byte 6 (Load Item) | 0 : APCDET 1 : TEMP |
| byte 7 (Laser Power Mode) | 0 : CD Read 1 : MO Read 2 : MO Write |
| byte 8 (Operation) | 0 : EEPROM → Host 1 : A/D Value → Host 2 : Host → EEPROM 3 : A/D → Host & EEPROM |

Table 6

5. RF/Servo Adj. Command

Byte 6 and 7 are defined as below.

28 : RF/Servo Adj

| | |
|----------------------|---|
| byte 6 (Adj Item) | 0 : FOK ofs 1 : FE ofs 2 : FBIAS 3 : TE ofs 4 : E-F bal 5 : F Gain 6 : T Gain |
| byte 7 bit 7-4 | 0 : EEPROM → Host 1 : Host → EEPROM 2 : Host → EVR/DA |
| byte 7 bit 3-0 | 0 : CD 1 : MO Groove 2 : MO Pit |

Table 7

5-2-2 TEMP Compensation

Note: This must be conducted immediately after turning on the power. Because temperature inside drive heat up by unit itself fever.

- a. Connect the unit to the adapter and the computer.
- b. Measure temperature in the room.
- c. Execute **[27 : A/D Load]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 01 (01 means Temp Mode)

Byte 07 : 00 (No means)

Byte 08 : 00 (Only report value on the EP-ROM to the Host Computer)

- d. Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

- e. Calculate value (Ad) to be set to the EP-ROM with following formula.

- e.-1 Convert the value (d) obtained item d in decimal digit.

- e.-2 Calculate (Ad) with following formula.

$$Ad = ((25 - \text{Temperature } (^{\circ}\text{C})) / 1.09) + d$$

- e.-3 Calculate the (Ad) in hexa decimal digit.

ex. Temperature : 28°C

Byte 05 (d) : 5Bh

$$Ad = (25 - 28) / 1.09 + 91d$$

$$= 88d = 58h$$

- f. Execute **[27 : A/D Load]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : Ad (hex)

Byte 06 : 01 (01 means Temp Mode)

Byte 07 : 00 (at 25°C)

Byte 08 : 02 (Write Byte 05 (Ad) on the EP-ROM)

5-2-3 Laser Power Adjustment

Note: Make sure Power Checker Cartridge of Power Checker is ejected.

- a. Connect AC adapter to the unit.

Note: Before any adjustment, make sure the unit under test is set in TEST mode by executing **[19 : Drive Status]** in Drive Control menu.

- b. Connect probes of Digital Multi Meter to LDIO (AP126) and LDI1 (AP127) on the Pin board. (Refer to Fig. 5-2-3)

- c. **Laser Power adjustment and Laser Current Measurement (Read Only Disc Read Mode)**

- c.-1 Turn on the Power Checker and set it as below. (For the details, refer to its instruction manual)

Wave length (λ) = 780nm

DBR / MAX switch : dBr

AUTO / MANUAL switch : AUTO

W / dB switch : W

- c.-2 Insert Power Meter Cartridge of it to the unit.

- c.-3 Execute **[20 : Reset]** in Drive Control Menu to set the OP head Ass'y on the Lead-in area.

Confirmation

- c.-4 Execute **[26 : Laser Power Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 00 (Only report value on the EP-ROM to the Host Computer)

Byte 07 : 00 (Read Only Disc Read Mode)

- c.-5 Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

- c.-6 Execute **[14 : Power Control]** in Drive Control Menu after setting **[Byte 05]** parameter to **[02]** (02 means the laser is set to Read Only Disc Read Power) in parameter window.

- c.-7 At the same time check if the value on Power Checker satisfy the specification of $400 \pm 50 \mu\text{W}$. If so, skip to item c.-12. If not, follow next item.

Adjustment

- c.-8 In case of over the specification, set the value (d-1) and execute **[26 : Laser Power Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the value on the Power Checker shows specification.

Byte 05 : d+1 or d-1 (hex)

Byte 06 : 02 (Set Byte 05 (d) on Ele Volume)

Byte 07 : 00 (Read Only Disc Read Mode)

In case of less than 370 μ W, set the value (d+1) and repeat [26 : Laser Power Adj.] execution.

- c.-9 At the same time check if the value on Power Checker satisfy the specification.

Setting value

- c.-10 Execute [26 : Laser Power Adj.] in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 01 (Write Byte 05 (d) on EP-ROM)

Byte 07 : 00 (Read Only Disc Read Mode)

- c.-11 At the same time measure the voltage on the Digital Multi Meter between LD10 (AP-126) and LD11 (AP-127) and check if the voltage is less than 0.31V. If it is over the 0.31V, replace Optical device with new one.

Just Reference: Laser current (I) can be calculated by the appeared voltage on the meter per resistance value (5 Ω).

- c.-12 Execute [14 : Power Control] in Drive Control Menu after setting [Byte 05] parameter to [00] (00 means the laser power off) in parameter window.

d. Laser Power Adjustment (Recordable Disc Read Mode)

Confirmation

- d.-1 Execute [26 : Laser Power Adj.] in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 00 (Only report value on EP-ROM to Host Computer)

Byte 07 : 01 (Recordable Disc Read Mode)

- d.-2 Read [Byte 05] whom number (d) is appeared 6th from " = " character left on cmd [x] > line.
- d.-3 Execute [14 : Power Control] in Drive Control Menu after setting [Byte 05] parameter to [03] (03 means the laser is set to Recordable Disc Read Mode) in parameter window.
- d.-4 At the same time check if the value on Power Checker satisfy the specification of 680 \pm 50 μ W. If so, skip to item d.-9. If not, follow next item.

Adjustment

- d.-5 In case of over the specification, set the value (d-1) and execute [26 : Laser Power Adj.] in Drive Control Menu after setting of following bytes in parameter window until the value on the Power Checker shows specification.

Byte 05 : d+1 or d-1 (hex)

Byte 06 : 02 (Set Byte 05 (d) on Ele Volume)

Byte 07 : 01 (Recordable Disc Read Mode)

In case of less than 0.68mW, set the value (d+1) and repeat [26 : Laser Power Adj.] execution.

- d.-6 At the same time check if the value on Power Checker satisfy the specification of 0.85 \pm 0.05mW.

Setting value

- d.-7 Execute [26 : Laser Power Adj.] in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 01 (Write Byte 05 (d) on the EP-ROM)

Byte 07 : 01 (Recordable Disc Read Mode)

- d.-8 At the same time measure the voltage on the Digital Multi Meter between LD10 (AP-126) and LD11 (AP-127) and check if the voltage is less than 0.33V. If it is over the 0.33V, replace Optical device with new one.

- d.-9 Execute [14 : Power Control] in Drive Control Menu after setting [Byte 05] parameter to [00] (00 means the laser power off) in parameter window.

e. Laser Power Adjustment (Recordable Disc Write Mode)

Confirmation

- e.-1 Execute [26 : Laser Power Adj.] in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 00 (Only report value on EP-ROM to Host Computer)

Byte 07 : 02 (Recordable Disc Write Mode)

- e.-2 Read [Byte 05] whom number (d) is appeared 6th from " = " character left on cmd [x] > line.
- e.-3 Execute [14 : Power Control] in Drive Control Menu after setting [Byte 05] parameter to [01] (01 means the laser is set to Recordable Disc Write Mode) in parameter window.

- e.-4 At the same time check if the value on Power Checker satisfy the specification of $6.8 \pm 0.05 \text{mW}$. If so, skip to item e.-9. If not, follow next item.

Adjustment

- e.-5 In case of over the specification, set the value (d-1) and execute [26 : Laser Power Adj.] in Drive Control Menu after setting of following bytes in parameter window until the value on the Power Checker shows specification.

Byte 05 : d+1 or d-1 (hex)

Byte 06 : 02 (Set Byte 05 (d) on Ele Volume)

Byte 07 : 02 (Recordable Disc Write Mode)

In case of less than 0.68mW , set the value (d+1) and repeat [26 : Laser Power Adj.] execution.

- e.-6 At the same time check if the value on Power Checker satisfy the specification of $6.8 \pm 0.05 \text{mW}$.

Setting value

- e.-7 Execute [26 : Laser Power Adj.] in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 01 (write Byte 05 (d) on EP-ROM)

Byte 07 : 02 (Recordable Disc Write Mode)

- e.-8 At the same time measure the voltage on the Digital Multi Meter between LD10 (AP-126) and LD11 (AP-127) and check if the voltage is less than 0.6V. If it is over the 0.6V, replace Optical device with new one.

- e.-9 Execute [14 : Power Control] in Drive Control Menu after setting [Byte 05] parameter to [00] (00 means Laser power off) in parameter window.

f. Turn off the Power Checker.

g. Eject the Power Checker Cartridge by pushing the eject button.

Note: Be sure to hold the Cartridge when ejecting.

h. Disconnect probes of Digital Multi Meter.

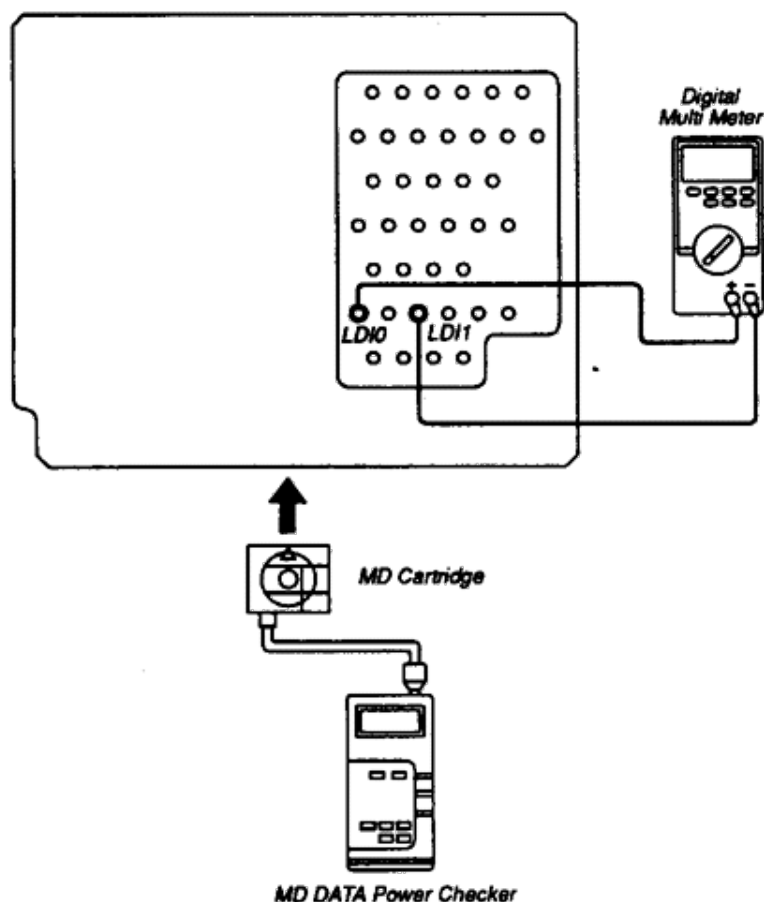


Fig. 5-2-3 Laser Power Adjustment

5-2-4 Focus Offset Adjustment

Note: Before any adjustment, make sure the unit under test is set in TEST mode by executing **19 : Drive Status** in Drive Control menu.

b. Loading Data of APCDET (Read Only Disc Read Mode)

b.-1 Execute **14 : Power Control** in Drive Control Menu after setting **Byte 05** parameter to **02** (02 means the laser is set to Read Only Disc Read Power) in parameter window.

b.-2 Execute **27 : A/D Load** in Drive Control Menu after setting following bytes in parameter window to write APCDET data on the EP-ROM.

Byte 06 : 00 (00 means APCDET Mode)

Byte 07 : 00 (Read Only Disc Read Mode)

Byte 08 : 03 (Report value of A/D Converter and write it on EE PROM)

b.-3 Execute **14 : Power Control** in Drive Control Menu after setting **Byte 05** parameter to **00** (00 means Laser power off) in parameter window.

c. Loading Data of APCDET (Recordable Disc Read Mode)

c.-1 Execute **14 : Power Control** in Drive Control Menu after setting **Byte 05** parameter to **03** (03 means the laser is set to Recordable Disc Read Mode) in parameter window.

c.-2 Execute **27 : A/D Load** in Drive Control Menu after setting following bytes in parameter window to write APCDET data on the EP-ROM.

Byte 06 : 00 (00 means APCDET Mode)

Byte 07 : 01 (Recordable Disc Read Mode)

Byte 08 : 03 (Report value of A/D Converter and write it on EE PROM)

c.-3 Execute **14 : Power Control** in Drive Control Menu after setting **Byte 05** parameter to **00** (00 means Laser power off) in parameter window.

d. Loading Data of APCDET (Recordable Disc Write Mode)

d.-1 Execute **14 : Power Control** in Drive Control Menu after setting **Byte 05** parameter to **01** (01 means the laser is set to Recordable Disc Write Mode) in parameter window.

d.-2 Execute **27 : A/D Load** in Drive Control Menu after setting following bytes in parameter window to write APCDET data on the EP-ROM.

Byte 06 : 00 (00 means APCDET Mode)

Byte 07 : 02 (Recordable Disc Write Mode)

Byte 08 : 03 (Report value of A/D Converter and write it on EE PROM)

d.-3 Execute **14 : Power Control** in Drive Control Menu after setting **Byte 05** parameter to **00** (00 means Laser power off) in parameter window.

e. Focus OK (FOK) Offset Adjustment Confirmation (Read Only Disc Mode)

e.-1 Connect probe (common) of Digital Multi Meter to Vc (AP1013) and probe (plus) ABCD (AP5030) on the Pin board. (Refer to Fig. 5-2-4 (a))

e.-2 Execute **01 : Switch Control** in Drive Control Menu after setting **byte 05** to **01** in parameter window. (01 means Read Only Disc Mode)

e.-3 Execute **28 : RF/Servo Adj.** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 00 (00 means Focus offset Mode)

Byte 07 : 00 (Only report value on EP-ROM to Host Computer in Read Only Disc Mode)

e.-4 Read **Byte 05** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

e.-5 Execute **28 : RF/Servo Adj.** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 00 (00 means Focus offset Mode)

Byte 07 : 20 (Set Byte 05 (d) on A/D Converter)

e.-6 At the same time check if the voltage on Digital Multi Meter between Vc (AP1013) and ABCD (AP5030) satisfy the specification of $0 \pm 20\text{mV}$. If so, skip to item e-10. If not, follow next step.

Adjustment

e.-7 In case of over the specification, set the value (d-1) and execute **28 : RF/Servo Adj.** in Drive Control Menu after setting of following bytes in parameter window until the value on the Digital Multi Meter shows specification.

Byte 05 : d+1 or d-1 (hex)

Byte 06 : 00 (00 means Focus offset Mode)

Byte 07 : 20 (Set Byte 05 (d) on A/D Converter)

In case of less than -20mV , set the value (d+1) and repeat **28 : RF/Servo Adj.** execution.

- e.-8 At the same time check if the voltage on Digital Multi Meter between Vc (AP1013) and ABCD (AP5030) satisfy the specification of $0 \pm 20\text{mV}$.

Setting Value

- e.-9 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 00 (00 means Focus offset Mode)

Byte 07 : 10 (Write Byte 05 (d) on EP-ROM)

Confirmation (Recordable Disc Mode)

- e.-10 Execute **[01 : Switch Control]** in Drive Control Menu after setting **[byte 05]** to **[00]** in parameter window. (00 means Recordable Disc Mode)

- e.-11 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 00 (00 means Focus offset Mode)

Byte 07 : 01 (Only report value on EP-ROM to Host Computer in Recordable Disc Mode)

- e.-12 Read **[Byte 05]** whom number (d) is appeared 6th from "=" character left on cmd [x] > line.

- e.-13 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 00 (00 means Focus offset Mode)

Byte 07 : 21 (Set Byte 05 (d) on A/D Converter)

- e.-14 At the same time check if the voltage on Digital Multi Meter between Vc (AP1013) and ABCD (AP5030) satisfy the specification of $0 \pm 20\text{mV}$. If so, skip to item f. If not, follow next step.

Adjustment

- e.-15 In case of over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the value on the Digital Multi Meter shows specification.

Byte 05 : d+1 or d-1 (hex)

Byte 06 : 00 (00 means Focus offset Mode)

Byte 07 : 21 (Set Byte 05 (d) on A/D Converter)

In case of less than -20mV, set the value (d+1) and repeat **[28 : RF/Servo Adj.]** execution.

- e.-16 At the same time check if the voltage on Digital Multi Meter between Vc (AP1013) and ABCD (AP5030) satisfy the specification of $0 \pm 20\text{mV}$.

Setting Value

- e.-17 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 00 (00 means Focus offset Mode)

Byte 07 : 11 (Write Byte 05 (d) on EP-ROM)

- f. Remove probes of Digital Multi Meter from the Pin board.

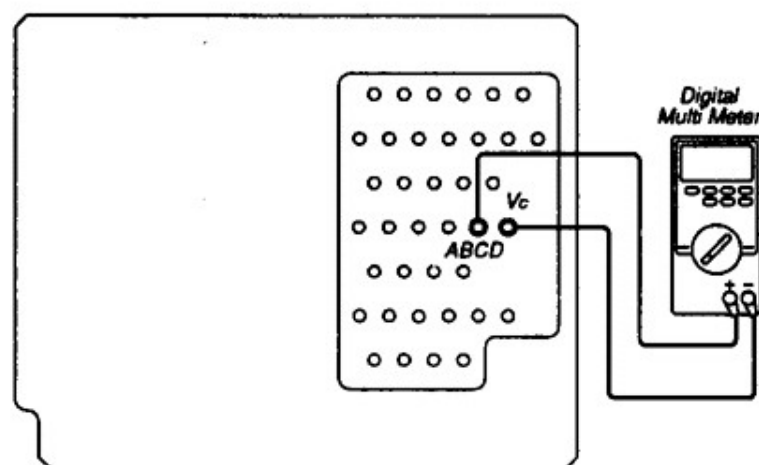


Fig. 5-2-4 (a) FOK Offset Adjustment

g. Focus Error (FE) Offset Adjustment

- g.-1 Set the F.Bias Switch on the Pin Board to Short position.
- g.-2 Connect probe (common) of Digital Multi Meter to Vc (AP1013) and probe (plus) to FE-O (AP5070) on the pin board. (Refer to Fig. 5-2-4 (b))

Confirmation (Recordable Disc Mode)

- g.-3 Execute [01 : Switch Control] in Drive Control Menu after setting [byte 05] to [00] in parameter window. (00 means Recordable Disc Mode)
- g.-4 Execute [28 : RF/Servo Adj.] in Drive Control Menu after setting of following bytes in parameter window.
- Byte 06 : 01 (01 means Focus offset Mode)
- Byte 07 : 01 (Only report value on EP-ROM to Host Computer in Recordable Disc Mode)
- g.-5 Read [Byte 05] whom number (d) is appeared 6th from " = " character left on cmd [x] > line.
- g.-6 Execute [28 : RF/Servo Adj.] in Drive Control Menu after setting of following bytes in parameter window.
- Byte 05 : d (hex)
- Byte 06 : 01 (01 means Focus offset Mode)
- Byte 07 : 21 (Set Byte 05 (d) on Ele value)
- g.-7 At the same time check if the voltage on Digital Multi Meter between Vc (AP1013) and FE-O (AP-5070) satisfy the specification of $0 \pm 20\text{mV}$. If so, skip to g.-10. If not, follow next step.

Adjustment

- g.-8 In case of over the specification, set the value (d-1) and execute [28 : RF/Servo Adj.] in Drive Control Menu after setting of following bytes in parameter window until the value on the Digital Multi Meter shows specification.
- Byte 05 : d-1 or d+1 (hex)
- Byte 06 : 01 (01 means Focus Error offset Mode)
- Byte 07 : 21 (Set Byte 05 (d) on Ele Volume)
- In case of less than -20mV , set the value (d+1) and repeat [28 : RF/Servo Adj.] execution.

Setting Value

- g.-9 Execute [28 : RF/Servo Adj.] in Drive Control Menu after setting of following bytes in parameter window.
- Byte 05 : d (hex)
- Byte 06 : 01 (01 means Focus Error offset Mode)
- Byte 07 : 11 (Write Byte 05 (d) on EP-ROM)

Confirmation (Read Only Disc Mode)

- g.-10 Execute [01 : Switch Control] in Drive Control Menu after setting [byte 05] to [01] in parameter window. (01 means Read Only Disc Mode)
- g.-11 Execute [28 : RF/Servo Adj.] in Drive Control Menu after setting of following bytes in parameter window.
- Byte 06 : 01 (01 means Focus offset Mode)
- Byte 07 : 00 (Only report value on EP-ROM to Host Computer in Read Only Disc Mode)
- g.-12 Read [Byte 05] whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

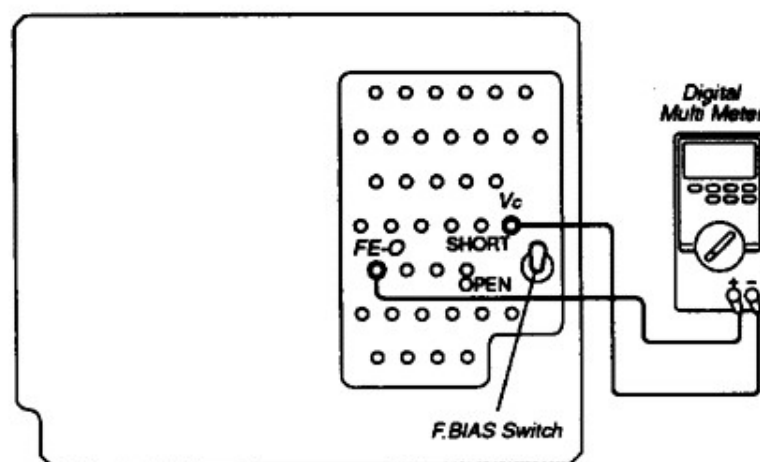


Fig. 5-2-4 (b) FE Offset Adjustment (F.BIAS SW : OPEN)
and F. BIAS Adjustment (F.BIAS SW : SHORT)

- g.-13 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 01 (01 means Focus offset Mode)

Byte 07 : 21 (Write Byte 05 (d) on Ele value)

- g.-14 At the same time check if the voltage on Digital Multi Meter between Vc (AP1013) and FE-O (AP-5070) satisfy the specification of $0 \pm 20\text{mV}$. If so, skip to g.-17. If not, follow next step.

Adjustment

- g.-15 In case of over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the value on the Digital Multi Meter shows specification.

Byte 05 : d-1 or d+1 (hex)

Byte 06 : 01 (01 means Focus Error offset Mode)

Byte 07 : 20 (Set Byte 05 (d) on Ele Volume)

In case of less than -20mV , set the value (d+1) and repeat **[28 : RF/Servo Adj.]** execution.

Setting Value

- g.-16 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 01 (01 means Focus Error offset Mode)

Byte 07 : 10 (Write data on EP-ROM)

- g.-17 Return the F.Bias Switch on the Pin Board to Open position.

h. Focus Bias Rough Adjustment (Read Only Disc Mode)

Confirmation

- h.-1 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 00 (Only report value on EP-ROM to Host Computer)

- h.-2 Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

- h.-3 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 20 (Set Byte 05 (d) on A/D Converter)

- h.-4 At the same time check if the voltage on Digital Multi Meter $\pm 50\text{mV}$. If so, skip to item i. If not, follow next step.

Adjustment

- h.-5 In case of over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the value on the Digital Multi Meter shows specification.

Byte 05 : d-1 or d+1 (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 20 (Set Byte 05 (d) on A/D Converter)

In case of lower than -50mV , set the value (d-1) and repeat **[28 : RF/Servo Adj.]** execution.

Setting Value

- h.-6 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the waveform on the oscilloscope shows specification.

Byte 05 : d (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 10 (Write Byte 05 (d) on EP-ROM)

i. Focus Bias Rough Adjustment (Recordable Disc Mode)

Confirmation

- i.-1 Execute **[01 : Switch Control]** in Drive Control Menu after setting **[byte 05]** to **[00]** in parameter window. (00 means Recordable Disc Mode)

- i.-2 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 01 (Only report value on EP-ROM to Host Computer)

- i.-3 Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

- i.-4 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 21 (Set Byte 05 (d) on A/D Converter)

- i.-5 At the same time check if the voltage on the Digital Multi Meter $100\text{mV} \pm 50\text{mV}$. If so, skip to 5-2-6. If not, follow next step.

Adjustment

- i.-6 In case of over 150mV, set the value (d+1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the value on the Digital Multi Meter shows specification.

Byte 05 : d-1 or d+1 (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 21 (Set Byte 05 (d) on A/D Converter)

In case of lower than 50mV, set the value (d-1) and repeat **[28 : RF/Servo Adj.]** execution.

Setting Value

- i.-7 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the value on the Digital Multi Meter shows specification.

Byte 05 : d (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 11 (Write Byte 05 (d) on EP-ROM)

5-2-5 EF Phase difference check

- Connect the BNC cables (applicable cable) of EF Phase difference Meter to E (AP1015), F (AP1022), ABCD (AP5030) on the Pin Board. (Refer to Fig. 5-2-5)
- Execute **[20 : Reset]** in Drive Control Menu.
- Insert a Re-Writable Adj. Disc to the unit.

- Execute **[16 : Step Out]** in Drive Control Menu after setting parameter to **[01]** (01 means no. of step out from current track) in parameter window.
- Execute **[13 : Focus On/Off]** in Drive Control Menu after setting **[Byte 05]** parameter to **[01]** (01 means Focus Servo On) in parameter window.
- Check if the indicated value on the EF Phase difference Meter, satisfies following of the specification.

Display = $\pm 50\text{dg}$.

- Execute **[16 : Step Out]** in Drive Control Menu after setting parameter to **[20]** (20 means no. of step out from current track) in parameter window.
- Execute **[13 : Focus On/Off]** in Drive Control Menu after setting **[Byte 05]** parameter to **[01]** (01 means Focus Servo On) in parameter window.
- Check if the indicated value on the EF Phase difference Meter, satisfies following of the specification.

Display = $\pm 50\text{dg}$.

- Execute **[03 : Stop]** in Drive Control Menu to escape from this mode.
- Eject a Re-Writable Adj. Disc.

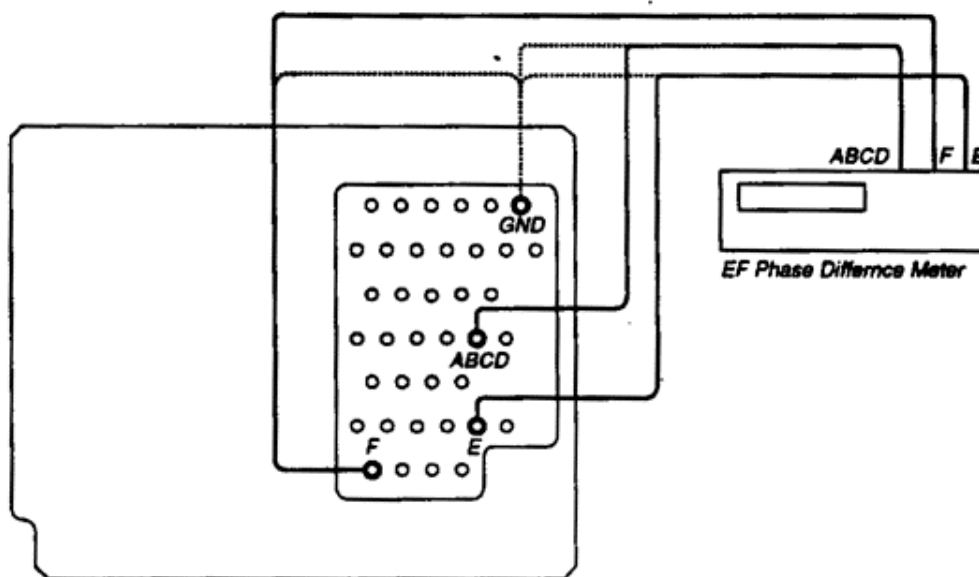


Fig. 5-2-5 EF Phase Difference Check

5-2-6 Tracking Offset Adjustment

Note: Before any adjustment, make sure the drive under test is set in TEST mode by executing **[19 : Drive Status]** in Drive Control menu.

- a. Connect the oscilloscope probe to Vc (AP1013) on the Pin board. Normally DC voltage of 1.75V (Vc) is obtained from Vc (AP1013). (Refer to Fig. 5-2-6)

Note: Don't connect the GND line, as oscilloscope probe, to Vc (AP1013).

Note: Set Oscilloscope as below.

Mode : Non storage
Display : CH-1
Range : 500mV/Div. 1ms/Div.
Trigger : Auto

- b. Adjust the voltage level of Vc (AP1013) to center scale of the oscilloscope by up/down adjusting knob.

c. EF Balance Adjustment

- c.-1 Insert a Re-Writable Adj. Disc to the unit.
- c.-2 Connect the oscilloscope probe the TE-O (AP5060) on the Pin board. (Refer to Fig. 5-2-6)

Confirmation (Recordable Disc Write Power)

- c.-3 Execute **[20 : Reset]** in Drive Control Menu to reset the unit to move OP head ass'y on Lead-in area.
- c.-4 Execute **[16 : Step Out]** in Drive Control Menu after setting parameter to **[10]** (10 means no. of step out from current track) in parameter window of it.

- c.-5 Execute **[13 : Focus On/Off]** in Drive Control Menu after setting **[Byte 05]** parameter to **[01]** (01 means Focus Servo On) in parameter window.

- c.-6 Execute **[14 : Power Control]** in Drive Control Menu after setting **[Byte 05]** parameter to **[01]** (01 means laser is set in Recordable Disc Write power) in parameter window.

- c.-7 Check if the EF Balance (ratio of plus and minus) meets the following formula. (Refer to Display 5-2-5.) If the ratio of EF Balance meet the formula, skip to item d. if not, follow next step.

$$|A-B| < 200\text{mV} \text{ or } C=2.5 \pm 1.0\text{V}$$

- c.-8 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 04 (04 means EF Balance Mode)

Byte 07 : 01 (Only read data on the EP-ROM to Host Computer.)

Adjustment

- c.-9 Read **[Byte 05]** whom number (d) is appeared 6th from "=" character left on cmd [x] > line.

- c.-10 In case of over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the value on the Digital Multi Meter shows specification.

Byte 05 : d-1 or d+1 (hex)

Byte 06 : 04 (04 means EF Balance Mode)

Byte 07 : 21 (Set Byte 05 (d) on Ele. Volume)

In case of less than -200mV, set the value (d+1) and repeat **[28 : RF/Servo Adj.]** execution.

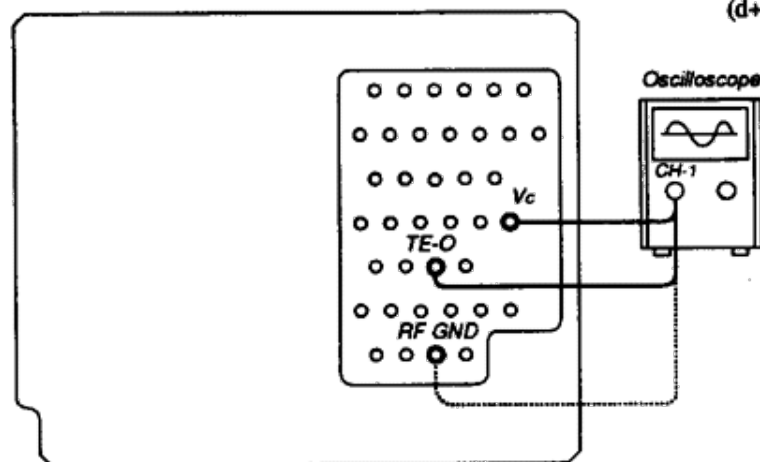


Fig. 5-2-6 Tracking Offset Adjustment

Setting Value

- c.-11 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the value on the waveform on the oscilloscope shows specification.

Byte 05 : d (hex)

Byte 06 : 04 (04 means EF Balance Mode)

Byte 07 : 11 (Write data on EP-ROM)

Note: If the output level (C) is over the specification, replace Optical device with new one.

d. TE Offset Adjustment

Confirmation (Groove on Recordable Disc)

- d.-1 Execute **[14 : Power Control]** in Drive Control Menu after setting **[Byte 05]** parameter to **[03]** (03 means laser is set in Recordable Disc Read power) in parameter window.

- d.-2 Check if the TE Offset output waveform on oscilloscope meets the following formula. (Refer to Display 5-2-6.) If the ratio of TE Offset output meet the formula, skip to item d-7. if not, follow next step.

$$-240\text{mV} < A-B < 0 \text{ or } C=2.5\pm 1.0\text{V}$$

- d.-3 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 03 (03 means TE Offset Mode)

Byte 07 : 01 (Only read data on EP-ROM to Host Computer)

Adjustment

- d.-4 Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.
- d.-5 In case of over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the waveform on the oscilloscope shows specification.

Byte 05 : d-1 or d+1 (hex)

Byte 06 : 03 (03 means TE Offset Mode)

Byte 07 : 21 (Set Byte 05 (d) on D/A Converter)

In case of under the specification, set the value (d+1) and repeat **[28 : RF/Servo Adj.]** execution.

Setting Value

- d.-6 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 03 (03 means TE Offset Mode)

Byte 07 : 11 (Write Byte 05 on EP-ROM)

Confirmation (Pit on Recordable Disc)

- d.-7 Execute **[03 : Stop]** in Drive Control Menu.
- d.-8 Execute **[20 : Reset]** in Drive Control Menu to reset the unit to set OP head ass'y on Pit area.
- d.-9 Execute **[13 : Focus On/Off]** in Drive Control Menu after setting **[Byte 05]** parameter to **[01]** (01 means Focus Servo On) in parameter window.

- d.-10 Put **[sts]** on cmd [xx] > line and confirm if following parameter are obtained on top line.

[RFSW1]
[RFSW0]

- d.-11 Check if the TE Offset output waveform on oscilloscope meets the following formula. (Refer to Display 5-2-5.) If the ratio of TE Offset output meet the formula, skip to item d-16. If not, follow next step.

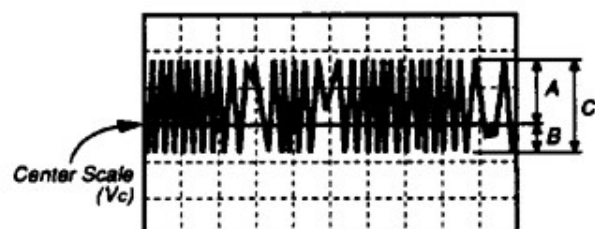
$$-240\text{mV} < A-B < 0 \text{ or } C=2.5\pm 1.0\text{V}$$

- d.-12 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 03 (03 means TE Offset Mode)

Byte 07 : 02 (Only read data on EP-ROM to Host Computer)

- d.-13 Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.



Display 5-2-6 Traverse Signal (TE-O)

Adjustment

- d.-14 In case of over the specification, set the value (d+1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the waveform on the oscilloscope shows specification.

Byte 05 : d+1 or d-1 (hex)

Byte 06 : 03 (03 means TE Offset Mode)

Byte 07 : 22 (Set Byte 05 (d) on D/A Converter)

In case of under the Vc level, set the value (d+1) and repeat **[28 : RF/Servo Adj.]** execution.

Setting Value

- d.-15 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 03 (03 means TE Offset Mode)

Byte 07 : 12 (Write Byte 05 on EP-ROM)

- d.-16 Execute **[3 : Stop]** in Drive Control Menu to escape from this mode.

- d.-17 Eject a Re-Writable Adj. Disc.

Confirmation (Put on Read Only Disc)

- d.-18 Insert a Read Only Disc (TGYS-9001).

- d.-19 Execute **[20 : Reset]** in Drive Control Menu to reset the drive to move OP head ass'y on Lead-in area.

- d.-20 Execute **[16 : Step Out]** in Drive Control Menu after setting parameter to **[10]** (10 means no. of step out from current track) in parameter window of it.

- d.-21 Execute **[13 : Focus On/Off]** in Drive Control Menu after setting **[Byte 05]** parameter to **[01]** (01 means Write Power On) in parameter window.

- d.-22 Check if the TE Offset output waveform on oscilloscope meets the following formula. (Refer to Display 5-2-6.) If the ratio of TE Offset output meet the formula, skip to item 5-2-4. If not, follow next step.

$$0 < A-B < 240\text{mV or } C=2.5\pm 1.0\text{V}$$

- d.-23 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 03 (03 means TE Offset Mode)

Byte 07 : 00

Adjustment

- d.-24 Read **[Byte 05]** whom number (d) is appeared 6th from "=" character left on cmd [x] > line.

- d.-25 In case of over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until the waveform on the oscilloscope shows specification.

Byte 05 : d-1 or d+1 (hex)

Byte 06 : 03 (03 means TE Offset Mode)

Byte 07 : 20

In case of under the specification, set the value (d+1) and repeat **[28 : RF/Servo Adj.]** execution.

Setting Value

- d.-26 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 03 (03 means TE Offset Mode)

Byte 07 : 10

5-2-7 Gain Adjustment

a. Focus Servo Loop Gain (Read Only Disc Mode)

a-1 Connect BNC Cables (one end) of CH-1 and CH-2 of Frequency Response Analyzer to the FI (AP5127) and FE0 (SP5090) (ground for GND (TP8342)) respectively. (Refer to Fig. 5-2-7 (a))

a-2 Connect BNC Cables (one end) of OSC to the FDI (AP5128) (ground for GND (TP8342)). (Refer to Fig. 5-2-7 (a))

a-3 Turn on the Frequency Response Analyzer and set test condition as below. (Refer to its Instruction Manual for setting condition.)

| | |
|-----------------------|---------|
| Disturbance Frequency | : 1.0k |
| Integration time | : 1 |
| Analysis mode | : 0 |
| Float | : GND |
| OSC Level | : 300mV |
| Over CH-1 | : 11 |
| Over CH-2 | : 11 |
| Scan Limit | : 0 |
| Delay Time | : 0.1 |
| Phase Range | : 0 |

Confirmation

a-4 Execute **[20 : Reset]** in Drive Control Menu to reset the unit.

a-5 Execute **[16 : Step Out]** in Drive Control Menu after setting parameter to **[20]** (20 means no. of step out from current Optical device position) in parameter window.

a-6 Execute **[2 : Spin Up]** in Drive Control Menu.

a-7 Hit **[Measure]** button on the analyzer to start the gain measurement.

a-8 After for a seconds, check if the Gain and Phase indicated on the analyzer, satisfy following both of the specifications. If they meet the formula, skip to item b. If not, follow next step.

Gain = $-14 \pm 0.5\text{dB}$

Phase = -25 to 0 degree

a-9 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 05 (05 means Focus Servo Loop Gain Mode)

Byte 07 : 00 (Only read data on EP-ROM to Host Computer)

a-10 Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

Adjustment

a-11 In case that either Gain or Phase value is over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until both value shows specification.

Byte 05 : d-1 or d+1 (hex)

Byte 06 : 05 (05 means Focus Servo Loop Gain Mode)

Byte 07 : 20 (Set Byte 05 (d) on Ele. Volume)

In case that either Gain or Phase value is less than specification, set the value (d+1) and repeat **[28 : RF/Servo Adj.]** execution.

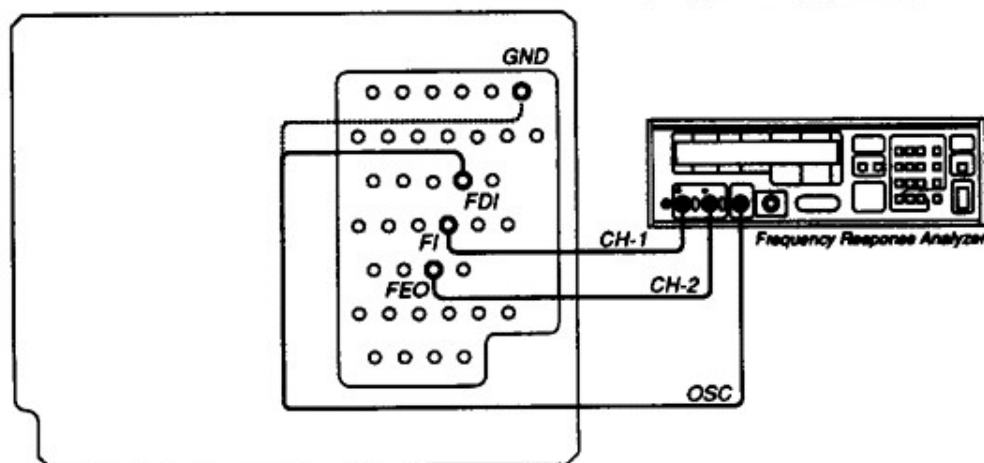


Fig. 5-2-7 (a) Focus Servo Loop Gain Adjustment

Setting Value

- a.-12 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until both value shows specification.
 - Byte 05 : d (hex)
 - Byte 06 : 05 (05 means Focus Servo Loop Gain Mode)
 - Byte 07 : 10 (Write data on EP-ROM)
- b. Hit the **[Stop]** button on the analyzer stop measurement.
- c. Execute **[3 : Stop]** in Drive Control Menu to escape from this mode.
- d. Eject a Read Only Disc (TGYS-9001).
- e. **Focus Servo Loop Gain (Recordable Disc Read Mode)**
 - e.-1 Insert a Re-Writable Adj. Disc to the unit.
 - e.-2 Execute **[20 : Reset]** in Drive Control Menu to reset the unit.
 - e.-3 Execute **[16 : Step Out]** in Drive Control Menu after setting parameter to **[20]** (20 means no. of step out from current track) in parameter window.
 - e.-4 Execute **[2 : Spin Up]** in Drive Control Menu.
 - e.-5 Hit **[Measure]** button on the analyzer to start the gain measurement.
 - e.-6 After for a seconds, check if the Gain and Phase indicated on the analyzer, satisfy following both of the specifications. If they meet the formula, skip to item f. If not, follow next step.
 - Gain = $-14 \pm 0.5\text{dB}$
 - Phase = -25 to 0 degree
 - e.-7 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.
 - Byte 06 : 05 (05 means Focus Servo Loop Gain Mode)
 - Byte 07 : 01 (Only read data on EP-ROM to Host Computer)
 - e.-8 Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

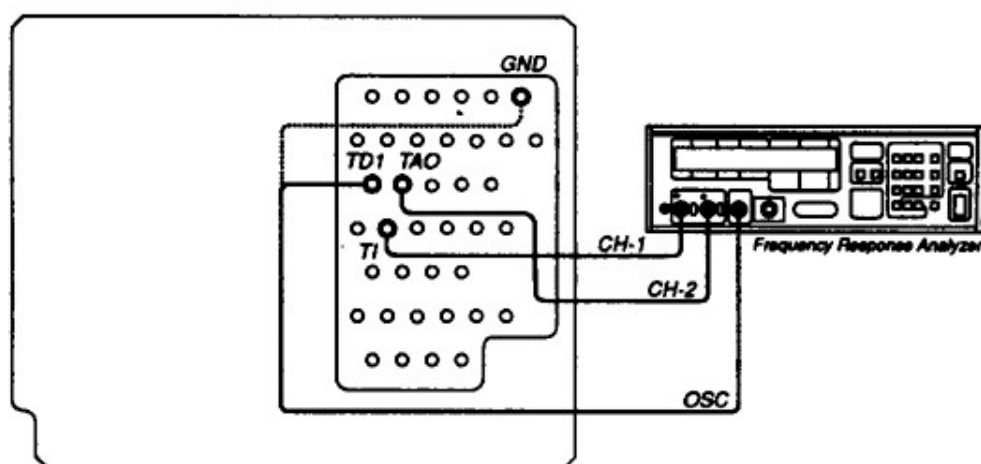


Fig. 5-2-7 (b) Tracking Loop Gain Adjustment

Adjustment

- e.-9 In case that either Gain or Phase value is over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until both value shows specification.

Byte 05 : d-1 or d+1 (hex)

Byte 06 : 05 (05 means Focus Servo Loop Gain Mode)

Byte 07 : 21 (Set Byte 05 (d) on Ele. Volume)

In case that either Gain or Phase value is less than specification, set the value (d+1) and repeat **[28 : RF/Servo Adj.]** execution.

Setting Value

- e.-10 In case that either Gain or Phase value is over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 05 (05 means Focus Servo Loop Gain Mode)

Byte 07 : 11 (Write Byte 05 (d) on EP-ROM)

- e.-11 Hit the **[Stop]** button on the analyzer stop measurement.

- e.-12 Execute **[3 : Stop]** in Drive Control Menu to escape from this mode.

f. Tracking Servo Loop Gain (Recordable Disc Read Mode)

- f.-1 Connect BNC Cables (one end) of CH-1 and CH-2 of Frequency Response Analyzer to the TI (AP5126) and TA0 (SP110) (ground for GND (TP8342)) respectively. (Refer to Fig. 5-2-7 (b))
- f.-2 Connect BNC Cables (one end) of OSC to the TDI (AP5129) (ground for GND (TP8342)). (Refer to Fig. 5-2-7 (b))
- f.-3 Turn on the Frequency Response Analyzer and set test condition as below. (Refer to its Instruction Manual for setting condition.)

Disturbance Frequency : 1.0k

Integration time : 1

Analysis mode : 0

Float : GND

OSC Level : 300mV

Over CH-1 : 11

Over CH-2 : 11

Scan Limit : 0

Delay Time : 0.1

Phase Range : 0

- f.-4 Execute **[20 : Reset]** in Drive Control Menu to reset the unit.
- f.-5 Execute **[16 : Step Out]** in Drive Control Menu after setting parameter to **[20]** (20 means no. of step out from current track) in parameter window.
- f.-6 Execute **[2 : Spin Up]** in Drive Control Menu.
- f.-7 Hit **[Measure]** button on the analyzer to start the gain measurement.
- f.-8 After for a seconds, check if the Gain and Phase indicated on the analyzer, satisfy following both of the specifications. If they meet the formula, skip to item f.-13. If not, follow next step.

Gain = -11.7 ± 0.5 dB

Phase = 155 to 180 degree

- f.-9 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 06 (06 means Tracking Servo Loop Gain Mode)

Byte 07 : 01 (Only read data on EP-ROM to Host Computer)

- f.-10 Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

Adjustment

- f.-11 In case that either Gain or Phase value is over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until both value shows specification.
- Byte 05 : d-1 or d+1 (hex)
- Byte 06 : 06 (06 means Tracking Servo Loop Gain Mode)
- Byte 07 : 21 (Set Byte 05 (d) on Ele. Volume)
- In case that either Gain or Phase value is less than specification, set the value (d+1) and repeat **[28 : RF/Servo Adj.]** execution.

Setting Value

- f.-12 In case that either Gain or Phase value is over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 06 (06 means Tracking Servo Loop Gain Mode)

Byte 07 : 11 (Write Byte 05 (d) on EP-ROM)

- f.-13 Hit the **[Stop]** button on the analyzer stop measurement.

- f.-14 Execute **[3 : Stop]** in Drive Control Menu to escape from this mode.

- f.-15 Eject a Re-Writable Adj. Disc.

g. Tracking Servo Loop Gain (Read Only Disc Mode)

- g.-1 Insert a Read Only Disc (TGYS-9001) to the unit.

- g.-2 Execute **[20 : Reset]** in unit Control Menu to reset the drive.

- g.-3 Execute **[16 : Step Out]** in Drive Control Menu after setting parameter to **[20]** (20 means no. of step out from current track) in parameter window.

- g.-4 Execute **[2 : Spin Up]** in Drive Control Menu.

- g.-5 Hit **[Measure]** button on the analyzer to start the gain measurement.

- g.-6 After for a seconds, check if the Gain and Phase indicated on the analyzer, satisfy following both of the specifications. If they meet the formula, skip to item f-10. If not, follow next step.

Gain = -11.7 ± 0.5 dB

Phase = 155 to 180 degree

- g.-7 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 06 (06 means Tracking Servo Loop Gain Mode)

Byte 07 : 00 (Only read data on EP-ROM to Host Computer)

- g.-8 Read **[Byte 05]** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

Adjustment

- g.-9 In case that either Gain or Phase value is over the specification, set the value (d-1) and execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until both value shows specification.

Byte 05 : d-1 or d+1 (hex)

Byte 06 : 06 (06 means Tracking Servo Loop Gain Mode)

Byte 07 : 20 (Set Byte 05 (d) on Ele. Volume)

- In case that either Gain or Phase value is less than specification, set the value (d+12) and repeat **[28 : RF/Servo Adj.]** execution.

Setting Value

- g.-10 Execute **[28 : RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 06 (06 means Tracking Servo Loop Gain Mode)

Byte 07 : 10 (Write Byte 05 (d) on EP-ROM)

- g.-11 Hit the **[Stop]** button on the analyzer stop measurement.

- g.-12 Execute **[3 : Stop]** in Drive Control Menu to escape from this mode.

- g.-13 Eject a Read Only Disc (TGYS-9001).

- g.-14 Disconnect the probes of the analyzer and turn off the power supply.

5-2-8 RF Adjustment

a. Focus Bias Fine Adjustment (Read Only Disc Mode)

- a.-1 Connect the BNC Cable (one end) lead from Jitter Meter to RF (AP5020) (ground for GND (TP8342)) on the Pin board through the RF Buffer Board. (Refer to Fig. 5-2-8)
- a.-2 Connect probe of the Oscilloscope to RF (AP5020) on the Pin board. (Refer to Fig. 5-2-8)

Note: Set Oscilloscope as below.

Mode : Non Storage
Display : CH-1 AC Coupling
Range : 200mV/Div. 0.5 μ s.
Trigger : Auto

- a.-3 Turn on the switches of Jitter Meter and Power Supply.
- a.-4 Turn off the switches of POLARITY, FB CENTER, MODE, RANGE on the Jitter Meter.
- a.-5 Set Function switch on the meter to ON. (PRE-SET)
- a.-6 Adj Jitter Adj. Volume so that the meter shows **20**.
- a.-7 Set FUNCTION switch on the meter to OFF. (MEASURE)

Note: Before inserting disc through adjustment, make sure the unit under test is set in TEST mode by executing **19 : Drive Status** in Drive Column menu.

- a.-8 Insert a Read Only Disc (TGYS-9001) to the unit.

- a.-9 Execute **2 : Spin Up** in Drive Control Menu.
- a.-10 Execute **5 : Seek** in Drive Control Menu after setting Cluster no. to **1000** in parameter window. (No need to set sector no. in parameter window.)
- a.-11 Execute **28 : RF/Servo Adj.** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 02 (02 means Focus Bias Mode)
Byte 07 : 00 (Report value on the EP-ROM to the Host Computer.)

- a.-12 Read **Byte 05** whom number (d) is appeared 6th from " = " character left on cmd [x] > line.

Adjustment

- a.-13 Execute **28 : RF/Servo Adj.** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)
Byte 06 : 02 (02 means Focus Bias Mode)
Byte 07 : 20 (Set Byte 05 (d) on A/D Converter)

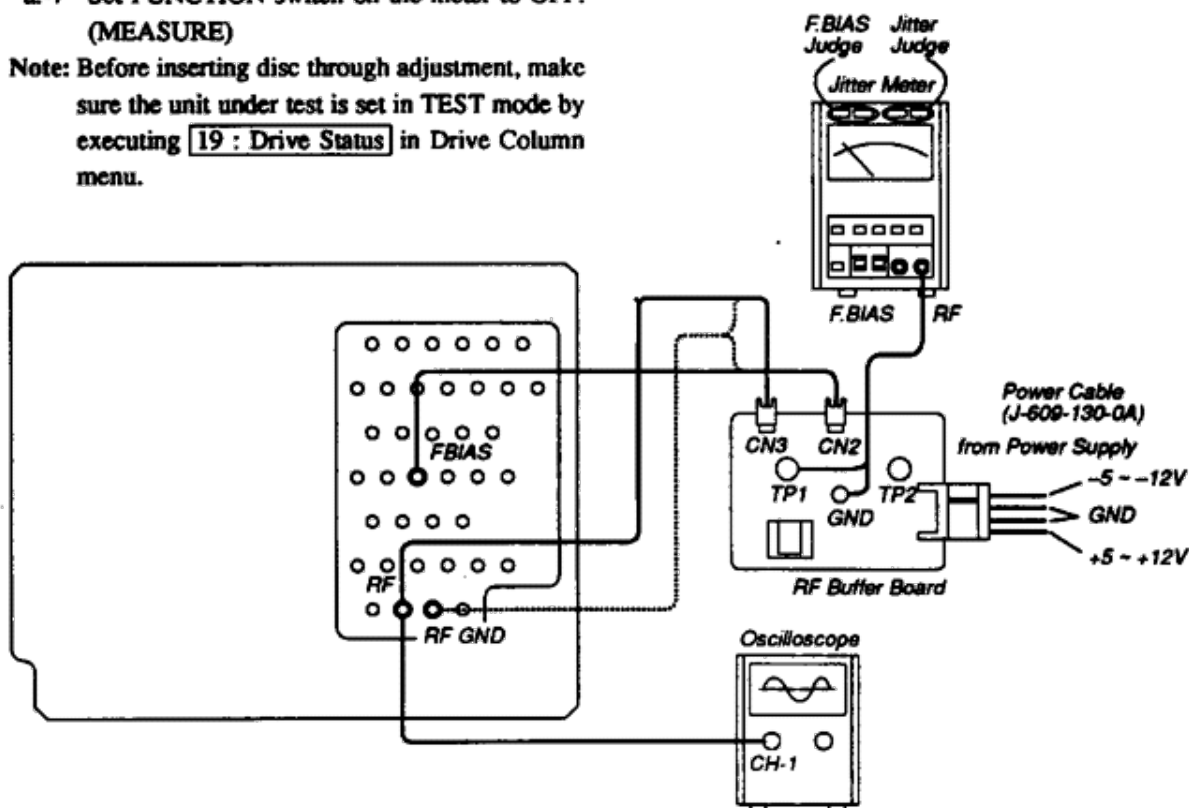


Fig. 5-2-8 RF Adjustment

- a.-14 Set the value (d+1) and execute **[28: RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until red NG indicator of Jitter Judgement goes on. At the same time read the value (fa) on the meter.

Byte 05 : d+1 (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 20 (Set Byte 05 (d) on A/D Converter)

- a.-15 Set the value (d-1) and execute **[28: RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until red NG indicator of Jitter Judgement goes on. At the same time read the value (fb) on the meter. (The Jitter value once get small and then become large.)

Byte 05 : d-1 (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 20 (Set Byte 05 (d) on A/D Converter)

- a.-16 Set the value $((fa + fb) / 2)$ and execute **[28: RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : $(fa + fb) / 2$ (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 20 (Set Byte 05 (d) on D/A Converter)

- a.-17 At the same time check if Go indicator goes on and the value on the Jitter is less than 20.8ns. If not replace Optical Device with new one.

Setting Value

- a.-18 Execute **[28: RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : $(fa + fb) / 2$ (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 10 (Write Byte 05 (d) on EP-ROM)

- a.-19 Read **[Byte 05]** whom number (d) is appeared 6th from "=" character left on cmd [x] > line.

- a.-20 Execute **[3: Stop]** in Drive Control Menu to escape from this mode.

- a.-21 Eject a Read Only Disc (TGYS-9001) by pushing the eject button.

- b. Focus Bias Fine Adjustment (Recordable Disc Mode)

- b.-1 Set FUNCTION switch on the meter to ON. (PRESET)

- b.-2 Adj Jitter Adj. Volume so that the meter shows **[30]**.

- b.-3 Set FUNCTION switch on the meter to OFF. (MEASURE)

- b.-4 Insert a Re-Writable Adj. Disc to the unit.

Note: This adjustment uses a disc area with reference RF signal recorded by reference drive at factory. If the reference signal is erased or overwritten, the disc will not be used. Refer to 2-2-4 for more information.

- b.-5 Execute **[2: Spin Up]** in Drive Control Menu.

- b.-6 Execute **[5: Seek]** in Drive Control Menu after setting Cluster no. to **[1000]** in parameter window. (No need to set sector no. in parameter window.)

Note: At the same time, if both of F.BIAS and Jitter NG lamp go on, adj Jitter adj. Volume so that the meter shows **[27]** in accordance with item b.-1 and b.-2.

- b.-7 Execute **[28: RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 01 (Report value on the EP-ROM to the Host Computer.)

- b.-8 Read **[Byte 05]** whom number (d) is appeared 6th from "=" character left on cmd [x] > line.

Adjustment

- b.-9 Execute **[28: RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : d (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 21 (Set Byte 05 (d) on A/D Converter)

- b.-10 Set the value (d+1) and execute **[28: RF/Servo Adj.]** in Drive Control Menu after setting of following bytes in parameter window until red NG indicator of Jitter Judgement goes on. At the same time read the value (fa) on the meter.

Byte 05 : d+1 (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 21 (Set Byte 05 (d) on D/A Converter)

- b.-11 Set the value (d-1) and execute **28 : RF/Servo Adj.** in Drive Control Menu after setting of following bytes in parameter window until red NG indicator of Jitter Judgement goes on. At the same time read the value (fb) on the meter. (The Jitter value once get small and then become large.)

Byte 05 : d-1 (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 21 (Set Byte 05 (d) on D/A Converter)

- b.-12 Set the value $((fa + fb) / 2)$ and execute **28 : RF/Servo Adj.** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : $(fa + fb) / 2$ (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

Byte 07 : 21 (Set Byte 05 (d) on D/A Converter)

- b.-13 At the same time check if Go indicator goes on and the value on the Jitter is less than 27.3ns. If not replace Optical Device with new one.

Setting Value

- b.-14 Execute **28 : RF/Servo Adj.** in Drive Control Menu after setting of following bytes in parameter window.

Byte 05 : $(fa + fb) / 2$ (hex)

Byte 06 : 02 (02 means Focus Bias Mode)

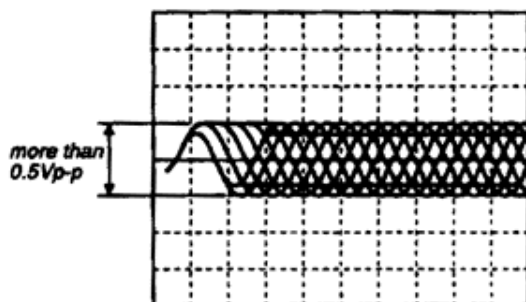
Byte 07 : 11 (Write Byte 05 (d) on EP-ROM)

- b.-15 Check if the RF signal output waveform on oscilloscope meets the following formula. (Refer to Display 5-2-8)

- b.-16 Execute **3 : Stop** in Drive Control Menu to escape from this mode.

- b.-17 Eject a Read Only Disc (TGYS-9001).

- b.-18 Remove the BNC Cables and Probe from the Pin Board and RF Buffer Board.



Display 5-2-8

5-2-9 Error Rate Measurement

- a. Connect Cable of Error Rate Counter as below. (Refer to Fig. 5-2-9)

- b. Set the switches on Error Rate Counter as follows.

| Switches | Side |
|----------|--------|
| SW1 | ON |
| SW2 | 10 sec |

c. Recordable Disc Mode

Note: Before any adjustment, make sure the unit under test is set in TEST mode by executing **19 : Drive Status** in Drive Control menu.

- c.-1 Insert a Re-Writable Adj. Disc to the unit.

Note: Re-Writable Adj. Disc with no defect or clarified no. of defect must be used for this measurement.

Note: This adjustment uses a disc area with reference RF signal recorded by reference drive at factory. If the reference signal is erased or overwritten, the disc will not be used. Refer to 2-2-4 for more information.

- c.-2 Execute **2 : Spin Up** in Drive Control Menu.

- c.-3 Execute **9 : Write Cluster** in Drive Control Menu after setting both of Cluster no. to **77** and length to **50** in parameter window. (No need to set sector no. in parameter window.)

- c.-4 Execute **5 : Seek** in Drive Control Menu after setting Cluster no. to **80** in parameter window. (No need to set sector no. in parameter window.) This is conducted around inner track of the disc.

- c.-5 Just read the 2nd showing value (C1, C2, ATER) on the Error rate counter after starting seeking operation, and the indicators satisfy the following formulas.

$$C1 \leq 50$$

$$C2 = 0$$

$$ATER < 0.5$$

- c.-6 Execute **9 : Write Cluster** in Drive Control Menu after setting both of Cluster no. to **1869** and length to **50** in parameter window. (No need to set sector no. in parameter window.)

- c.-7 Execute **[5 : Seek]** in Drive Control Menu after setting Cluster no. to **[1872]** in parameter window. (No need to set sector no. in parameter window.) This is conducted around outer track of the disc.
- c.-8 After for a while, read the value on the Error Rate Counter.
- c.-9 Just read the 2nd showing value (C1, C2, ATER) on the Error rate counter after starting seeking operation, and the indicators satisfy the following formulas.
- $C1 \leq 50$
 $C2 = 0$
 $ATER < 0.5$

Note: It must be conducted within 20 sec.

- c.-10 Execute **[3 : Stop]** in Drive Control Menu to escape from this mode.
- c.-11 Eject a Re-Writable Adj. Disc.

d. Read Only Disc Mode

Note: Before any adjustment, make sure the unit under test is set in TEST mode by executing **[19 : Drive Status]** in Drive Control menu.

- d.-1 Insert a Read Only Disc (TGYS-9001) to the unit.
- d.-2 Execute **[2 : Spin Up]** in Drive Control Menu.
- d.-3 Execute **[5 : Seek]** in Drive Control Menu after setting Cluster no. to **[80]** in parameter window. (No need to set sector no. in parameter window.) This is conducted around inner track of the disc.

- d.-4 Just read the 2nd showing value (C1, C2, ATER) on the Error rate counter after starting seeking operation, and the indicators satisfy the following formula. If the measured value does not satisfy the formulas, repeat 5-2-7 RF Adjustment or check Optical Device or MAM mounted board.

$$C1 \leq 30$$

$$C2 = 0$$

Note: Although ATER is shown, Read Only Disc (TGYS-9001) does not have ATER function.

- d.-5 Execute **[5 : Seek]** in Drive Control Menu after setting Cluster no. to **[1872]** in parameter window. (No need to set sector no. in parameter window.) This is conducted around outer track of the disc.

- d.-6 Just read the 2nd showing value (C1, C2, ATER) on the Error rate counter after starting seeking operation, and the indicators satisfy the following formula. If the measured value does not satisfy the formulas, repeat 5-2-8 RF Adjustment or check Optical Device or MAM mounted board.

$$C1 \leq 30$$

$$C2 = 0$$

- d.-7 Execute **[3 : Stop]** in Drive Control Menu to escape from this mode.
- d.-8 Eject a Read Only Disc (TGYS-9001).
- d.-9 Disconnect the cable from the Pin Board and turn off SW1 of Error Rate Counter.

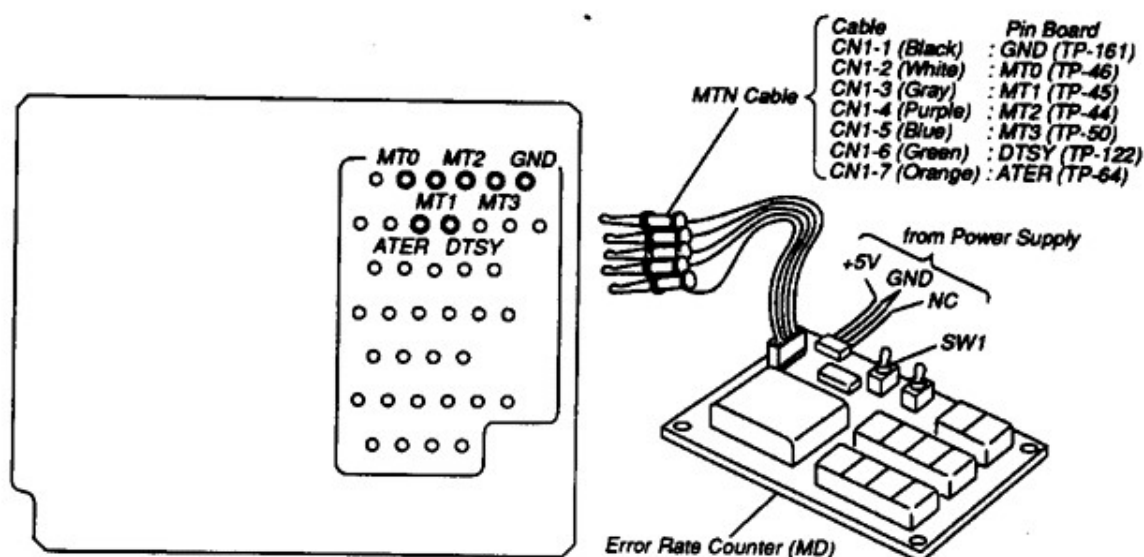


Fig. 5-2-9 Error Rate Measurement

5-2-10 Motor Jitter Measurement

- Connect BNC Cable (one end) of Pulse Jitter Counter to FMCK (TP-765) (ground for GND (AP5124)) on the Pin Board. (Refer to Fig. 5-2-10)
- Turn on the Pulse Jitter Counter and set it as below. (For the details, refer to instruction manual)

STATISTICS : σ (setting by left or right arrow key.)

Function : Period

Sample Number : 10000

After the setting above, push **RETURN** button to set the parameter.

Level : 1.5V (Hit **RETURN** button after the selecting by **up** arrow key.)

Note: Make sure Level is selected ON. (not 0V)

Window L : 120

Window H : 160 (Hit **RETURN** button after the selecting by **down** arrow key.)

Note: Make sure window is selected ON.

Window H/L : HOLD OFF

- Insert a Re-Writable Adj. Disc to unit.
- Execute **2 : Spin Up** in Drive Control Menu.
- Execute **5 : Seek** in Drive Control Menu after setting Cluster no. to **500** in parameter window. (No need to set sector no. in parameter window.) This is conducted around inner track of the disc.
- After for a while, check if the value is less than $2.25\mu\text{s}$. If it is out of specification, check motor driver circuit.
- Execute **3 : Stop** in Drive Control Menu to escape from this mode.
- Eject a Re-Writable Adj. Disc.
- Once execute **F8 : Exit** in Drive Control Menu to quit this program.
- Turn off the power of the unit and the computer.

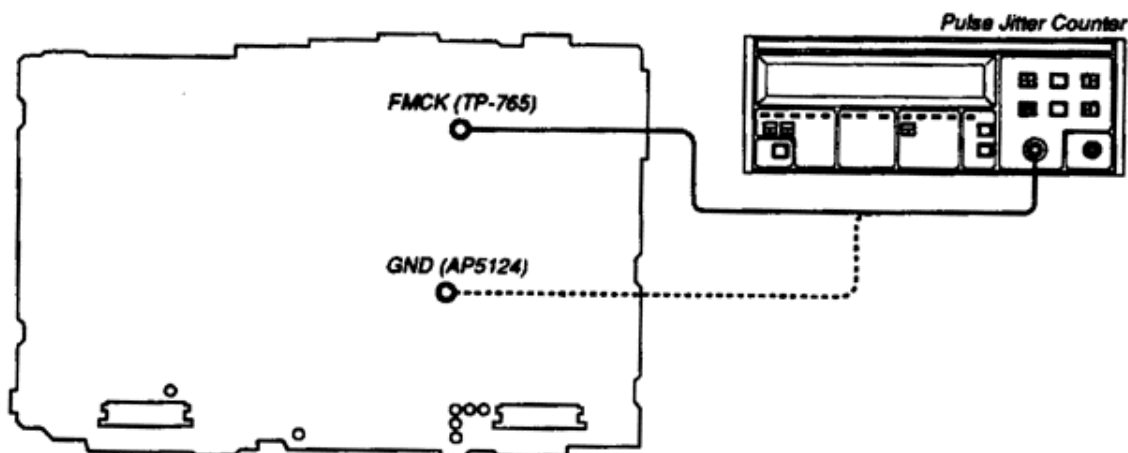


Fig. 5-2-10 Motor Jitter Measurement

5-3 VOLTAGE OUTPUT MEASUREMENT

- a. Set the switches on the unit as below.

POWER Mode Select : DATA

Others : don't care

- b. Connect the unit to the host computer through a serial port as shown in Fig. 2-3-2.

Note: After connecting the unit to be tested, load **TEST** program in accordance with section 5-1.

5-3-1 Power Supplying from LIP-12 Rechargeable Battery (Lithium-ion Battery Pack)

Make sure LIP-12 Rechargeable Battery is charged fully. ($4.1 \pm 0.1V$) (Refer to Fig. 5-3 (b))

- Put the LIP-12 Rechargeable Battery to the unit.
- Power on the unit. (The mode SW is "DATA" side)
- The voltage of $4.1V \pm 0.1V$ is obtained at UNREG1 (TP8332) on the Pin board.
- Turn off the unit. (The mode SW is "Power off")
- Put out the LIP-12 Rechargeable Battery to the drive.

5-3-2 Power Supplying from AC Adapter

- Connect the AC Adapter to the unit.
- Power on the unit. (The mode SW is "DATA" side)
- The voltage of 6 to 8V is obtained at UNREG1 (TP8332) on the Pin board.
- Turn off the unit. (The mode SW is "Power off")

5-3-3 Regulator Function Check

a. 3.5V-1 and 4.75V Regulators Check

- Connect the AC Adapter to the unit.
- Power on the unit. (The mode SW is "DATA" side)

- Check if the voltage of $3.5V \pm 0.1V$ (or $4.75V \pm 0.1V$) is obtained at 3.5V-1 (AP8114) (or 4.75V (AP8341)) on the Pin board.

Note: If the voltage of $3.5V \pm 0.1V$ or $4.75V \pm 0.1V$ is not obtained, check /XPCONT3 signal (TP8323) signal. (When it is True, the voltage of $3.5V \pm 0.1V$ or $4.75V \pm 0.1V$ is obtained.)

- Turn off the unit. (The mode SW is "Power off")

b. 3.5V-2 Regulator Check

- Connect the AC Adapter to the unit.
- Power on the unit. (The mode SW is "DATA" side)
- Execute **[20: Reset]** in Drive Control Menu.
- Check if the voltage of $3.5V \pm 0.1V$ is obtained at 3.5V-2 (TP8340)) on the Pin board.

Note: If the voltage of $3.5V \pm 0.1V$ is not obtained, check /PCONT2 (TP8322) signal. (When it is True, the voltage of $3.5V \pm 0.1V$ is obtained.)

- Turn off the unit. (The mode SW is "Power off")

c. 2.85V Regulator Check

- Connect the AC Adapter to the unit.
- Power on the unit. (The mode SW is "DATA" side)
- Check if the voltage of $2.85V \pm 0.1V$ is obtained at 2.85V (AP8333) on the Pin board.

Note: If the voltage of $2.85V \pm 0.1V$ is not obtained, check /PCONT2 signal. (When it is True, the voltage of $2.85V \pm 0.1V$ is obtained.)

- Turn off the unit. (The mode SW is "Power off")

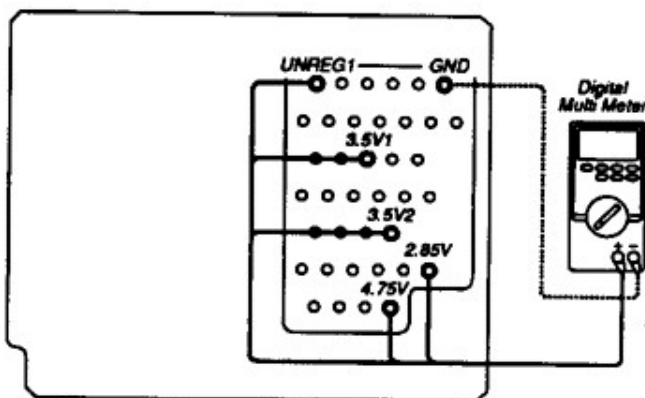


Fig. 5-3 (a) Voltage Output Measurement

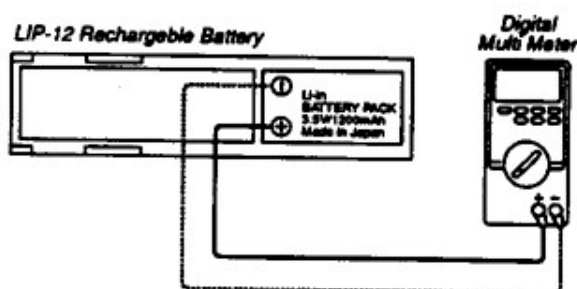


Fig. 5-3 (b)

5-4 CPU DIGITAL CHECK

This check is to check the result of inquiry test which makes handshake between host computer and unit under test by SCSI command. For them, in accordance with part of section 3-3-1, procedure of ATP, this check can be performed.

- In accordance with section 3-2-1, boot up the computer.
- If the every vender and product name and unit version on Display 3-3-1 (a) is obtained, CPU Digital check is OK, if not, check BUS line or buffer ICs.

5-5 PWM AMP CHECK

- Set the switches on the unit as below.
POWER Mode Select : DATA
Others : don't care
- Connect the unit to the host computer through a serial port as shown in Fig. 2-3-2.

Note: After connecting the drive to be tested, load **TEST** program in accordance with section 5-1.

- Connect CH-1 and CH-2 probes of Oscilloscope to FCS+(TP-101) and FCS-(TP-104) on the MAM Mounted Board respectively. (Refer to Fig. 5-5 (a))

Note: Set Oscilloscope as below.

Display : CH-1/CH-2
Range : 1V/div. 500ns.
Trigger : AUTO

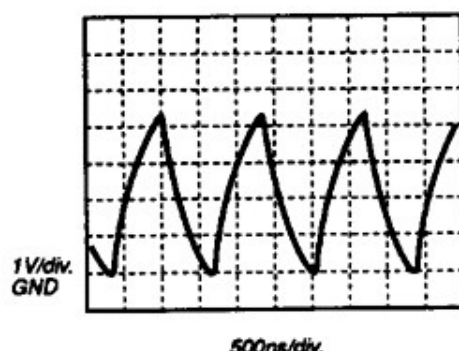
- Connect the AC Adapter to the unit.
- Execute **20 : Reset** in Drive Control Menu.
- Focus check
 - Put **w&fffc7,fd** on cmd [x] > line. (reset power save mode)
 - Put both of **w80006,3c**, **w80006,03** and **w80006,3c**, **w80006,02** on cmd [x] > line in order. (The lens on the optical device moves up.)

Note: Do not keep this state so long, or Optical device may be damaged.

- At that time Display 5-5 (a) appears on the Oscilloscope.

Note: If the waveform shown in Display 5-5 does not satisfy the specification, check IC509.

- Put **w80006,00**, **wfffc7,02** on cmd [x] > line. (Escape from this mode.)



Display 5-5 (a) Focus Coil Drive Voltage

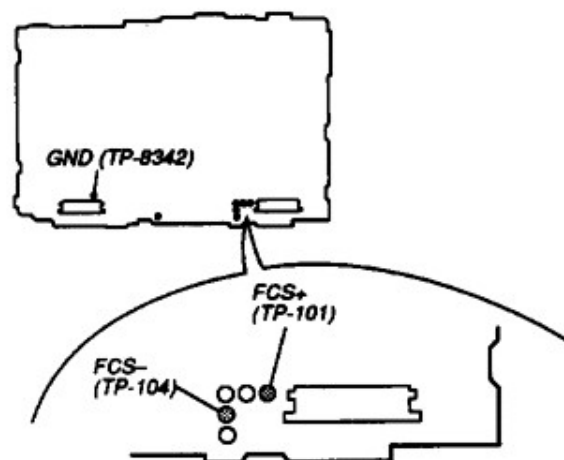
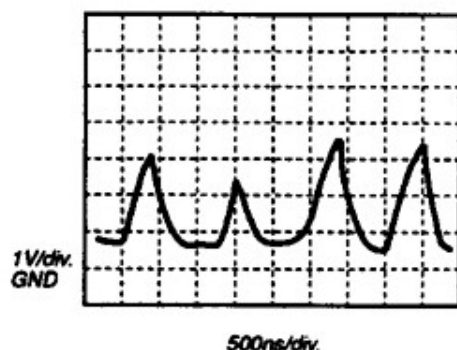


Fig. 5-5 (a)

f. Tracking check

- f.-1 Connect CH-1 and CH-2 probes of Oscilloscope to TRK+(TP-102) and TRK-(TP-103) on the Pin board respectively. (Refer to Fig. 5-5 (b))
 - f.-2 Execute **[20:Reset]** in Drive Control Menu.
 - f.-3 Put **[w&ffc7,fd]** on cmd [x] > line. (reset power save mode)
 - f.-4 Put both of **[w80006,28]**, and **[w80006,2c]** on cmd [x] > line. (The lens on the optical device moves to puter track of the disc.)
 - f.-5 At that time Display 5-5 (b) appears on the Oscilloscope.
- Note: If the waveform shown in Display 5-5 does not satisfy the specification, check IC509.
- f.-6 Put **[w80006,20]**, **[wffc7,02]** on cmd [x] > line. (Escape from this mode.)
 - g. Turn off the power supply.



Display 5-5 (b) Tracking Coil Drive Voltage

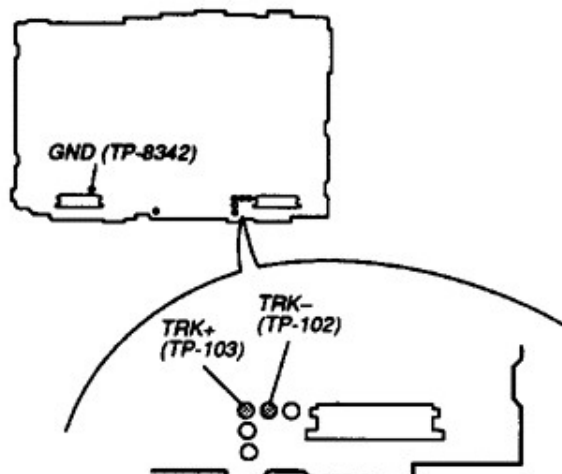


Fig. 5-5 (b)

5-6 SPINDLE MOTOR CHECK

- a. Set the switches on the unit as below.
POWER Mode Select : DATA
Others : don't care
 - b. Connect the unit to the host computer through a serial port as shown in Fig. 2-3-2.
- Note: After connecting the unit to be tested, load **[TEST]** program in accordance with section 5-1.
- c. Connect the probe of Digital Multi Meter to VS (TP8301) on the Pin board. (Refer to Fig. 5-6)
 - d. Connect the AC Adapter to the unit.
 - e. Insert a Re-Writable Adj. Disc to Drive.
 - f. Execute **[20:Reset]** in Drive Control Menu.
 - g. Put **[w80015,00]** on cmd [x] > line. (Set spindle muting mode by setting Q503 to off.)
 - h. Put **[w80005,81]**, **[w80001,8c]**, **[w80000,83]** on cmd [x] > line in order. (Spindle motor rotation starts.)
 - i. At that time check the value on the Digital Multi Meter is more than DC3V.
- Note: If it does not satisfy the specification, check Motor driver.
- j. Execute **[3:Stop]** in Drive Control Menu to escape from this mode.
 - k. Execute **[F8:Exit]** in Drive Control Menu to quit this program.
 - l. Turn off the computer.

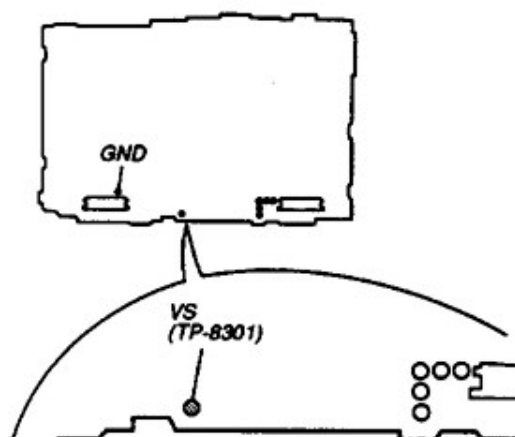


Fig. 5-6

5-7 AUDIO OUTPUT LEVEL CHECK

- a. Set the switches on the unit as below.
POWER Mode Select : DATA
Others : don't care
- b. Connect the remote controller to the unit.
- c. Connect the Line Out Cable to the Line Out Connector to get R or L channel easily.
- d. Connect the probe of oscilloscope to terminal of L or R on unit. (Refer to Fig. 5-7)

Note: Set oscilloscope as below.

Display : CH-1/CH-2
Range : 1V/div. AC 1ms/div.
Trigger : AUTO

- d. Connect the AC Adapter to the unit.

- e. Playing only left channel (1kHz)
 - e.-1 Insert Audio Test Disc (TGYS-1) to the unit.
 - e.-2 Start playing track **[30]** using the remote controller.
 - e.-3 At that time, check the waveform (1kHz) shown in Display 5-7 appears on the Oscilloscope.
- f. Playing only right channel (1kHz)
 - f.-1 Start playing track **[34]** using the remote controller.
 - f.-2 At that time, check the waveform (1kHz) shown in Display 5-7 appears on the Oscilloscope.
- g. Turn off the power supply.

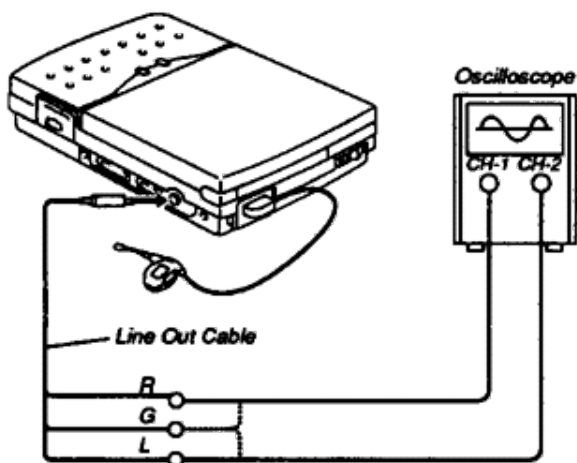
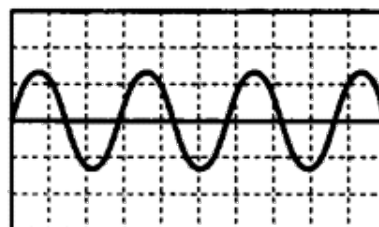


Fig. 5-7 Audio Output Level Check



Display 5-7 1kHz Sign wave

5-8 DOWN LOAD PROGRAM

5-8-1 Pre-Setting

- a. Set the switches on the unit as below.

POWER Mode Select : DATA

Others : don't care

- b. Connect the unit to the host computer through SCSI as shown in Fig. 2-3-1.
- c. Set some switches on the unit so that its setting is the same as factory shipping in accordance with Table 6-1-2.
- d. Connect the AC Adapter to the unit, and then turn the computer on.
- e. After system loading, insert Down Load system disk (OR-D702WA) into the drive A.
- f. Change the directory in the drive A.
- g. Type execution file name **DLMD** and hit **Enter** key. (Display 5-8-1 shows up.)

- h. Type unit SCSI ID no. and hit **Enter** key. (Display 5-8-2 shows up.)
- i. Eject the Down Load system disk (OR-D702WA) and then insert one of the Program disk listed on "Firmware Drive Ver. comparative table".
- j. Type Object file name indicated on the disk label and hit **Enter** key. (Display 5-8-3 shows up.)
- k. Hit **Y**, **Enter** key to start the down loading. (It takes a few minutes) (Display 5-8-4 shows up)

Note: By LED located front panel of the unit, it is found if Down loading is completed.

In case that Green and Umber color blinks alternately : completion

In other case (keep lighting, do not light)
: incompletion

When this process is not completed, change ROM (IC812 a firmware pre-loaded) with new one and try down load process again.

- l. Quit from this program by hitting **q** key.

FLASH ROM Down Load Program vx.x for MD DATA Driver
(c) Copyrights Sony corporation 1994

Connect the xxxxxx to the computer.
Turn on the power supply.
Make sure any disc is not inserted.

Enter Drive SCSI ID no. : x
version : B.37

Display 5-8-1

TARG_SENSE : NOT_RDY (02) AD_COD : (3a,00)
Enter Object File name :

Display 5-8-2

Download a : xxxxxxxxx.hex --> xxxxxx
Push Enter key to start (Y/N)

Display 5-8-3

```

Write_Buff
CDB :XX XX XX XX XX XX XX XX XX
-WR_BUFF OK

```

Please wait until Green and Umber color blinks altanately.
Then quit from this program and turn of the power.

Display 5-8-4

5-9 OPTICAL DEVICE CLEANING

5-9-1 Cleaning with Lens Cleaner

- a. Set the switches on the unit as below.

POWER Mode Select : DATA

Others : don't care

- b. Connect the unit to the host computer through a serial port as shown in Fig. 2-3-2.

Note: After connecting the unit to be tested, loard **TEST** program in accordance with section 5-1.

- c. Connect the AC Adapter to the unit.
- d. Execute **20 : Reset** in the Drive Control Menu.
- e. Execute **07 : Read TOC** in the Drive Control Menu.
- f. Remove the Mech Deck Cover Ass'y and Upper Panel to the drive. (Refer to section 4-1 and 4-6)

- g. Soak cotton swab in the Lens Cleaner.

- h. Wipe the Lens surface lightly using a cotton swab. (Refer to Fig. 5-9)

Note: Please use the wet cotton swab unless the nature of the dust on the Lens is rather sticky or greasy which may require cleaning liquid. After removing dirt and dusts, please wipe once again using a dried cotton swab.

Note: Do not apply an excessive force to the lens as it is rather delicate mechanism. Also pay attention not to hit on the over write head.

Note: Make sure that no residue remains on the Lens.

- i. After the cleaning, check if the RF output level satisfy the specification. (Refer to 5-2-8)

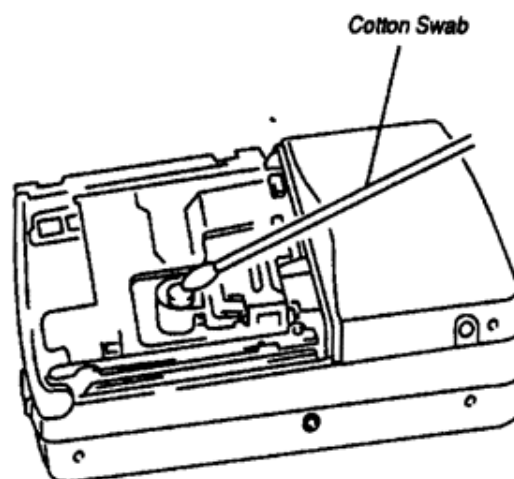
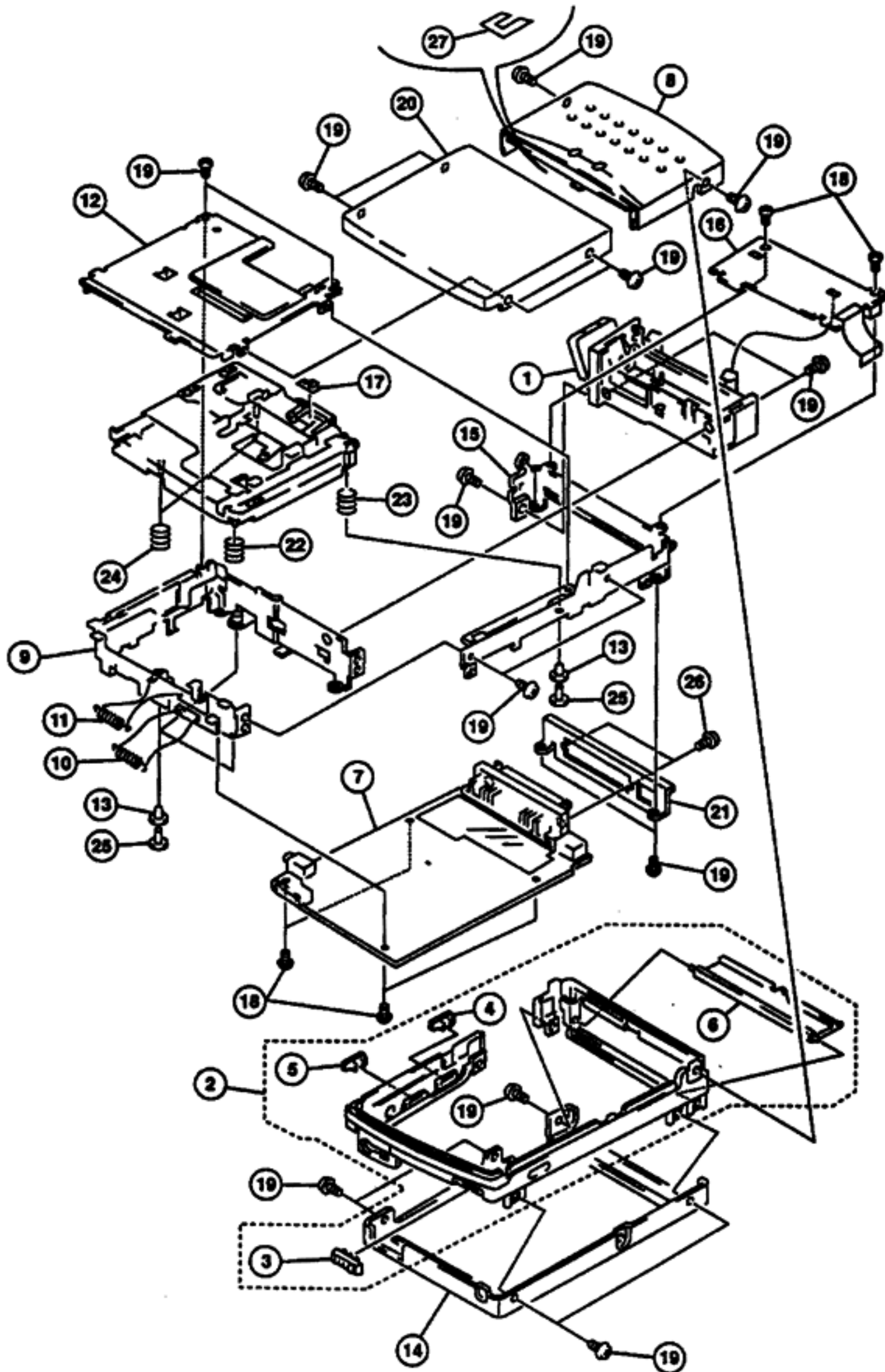


Fig. 5-9 Optical Device Cleaning

SECTION 6 EXPLODED VIEWS AND LIST

6-1 MECHANICAL ASS'Y LOCATION

6-1-1 Overall Ass'y

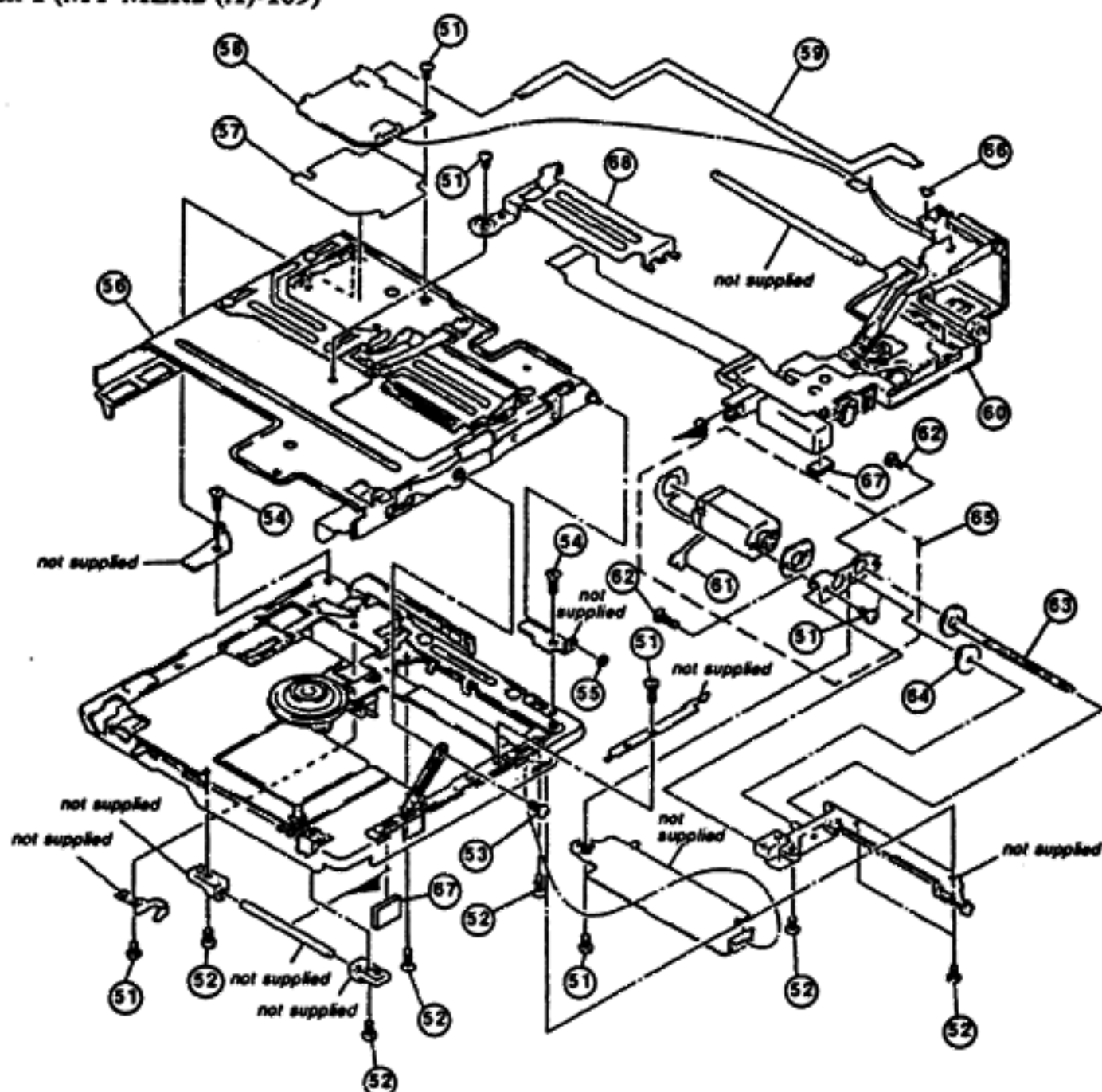


- Note:** 1. Items marks "*" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
2. Substitute the screws and washers may be supplied that are similar to ones listed because of Sony's part standardization program.
3. When the MAM Mounted Board (service) replacement, perform the program downloading in accordance with section 5-8.

The components identified by mark Δ or dotted line with mark Δ are critical for safety. Replace only with part number specified.

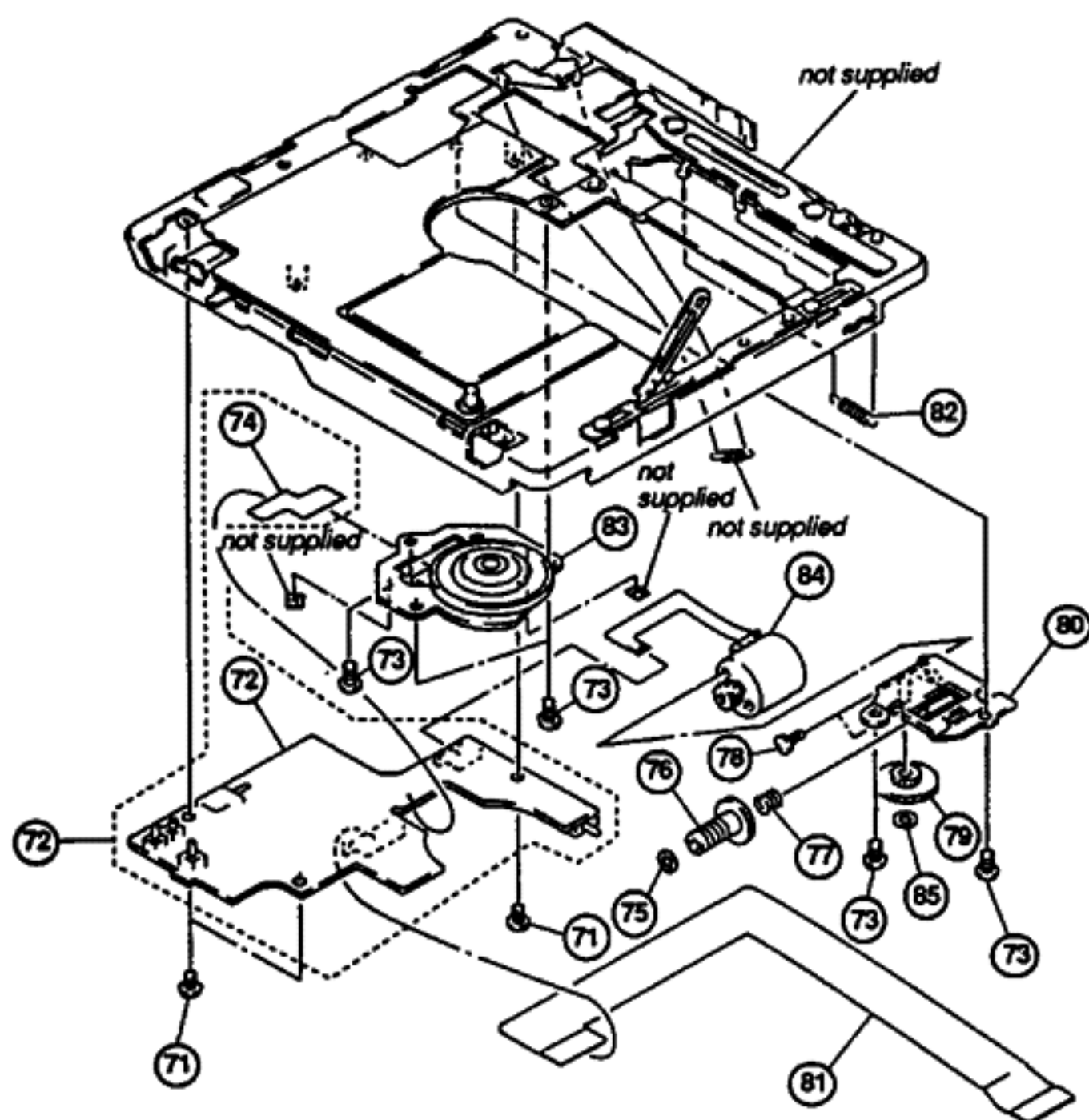
| <u>No.</u> | <u>Parts No.</u> | <u>Description</u> |
|------------|------------------|--|
| 1 | A-8010-649-A | Battery Case Ass'y |
| 2 | A-8031-038-A | Ornamental Belt Ass'y |
| 3 | 4-628-574-01 | Knob (OPEN) |
| 4 | 4-628-575-01 | Knob (AVLS) |
| 5 | 4-628-576-01 | Knob (POWER) |
| 6 | 4-628-579-01 | Rear Door |
| 7 | A-8053-806-A | MAM-F2 (J) Mounted Board (for J1) |
| | A-8053-805-A | MAM-F2 (E) Mounted Board (for UC2, AE4, CEJ, CEK) |
| 8 | * X-4620-899-1 | Rear Panel Ass'y |
| 9 | * X-4620-900-1 | Front Frame Ass'y |
| 10 | 4-628-559-01 | Tension Spring |
| 11 | 4-628-560-01 | Tension Spring |
| 12 | * X-4620-901-1 | Mechanical Deck Cover Ass'y |
| 13 | 4-963-909-01 | Damper |
| 14 | X-4620-902-2 | Bottom Panel Ass'y |
| 15 | * X-4620-906-1 | Rear Frame Ass'y |
| 16 | 1-473-009-11 | DC-DC Converter Unit |
| 17 | 1-769-309-11 | 0.5MM Pitch Flat Cable |
| 18 | 3-345-648-91 | Toothed Lock Screw (M1.4x2) (light gold) |
| 19 | 3-703-816-24 | Special Head Screw (M1.4x2.5) (black) |
| 20 | * 4-628-589-01 | Upper Panel |
| 21 | * 4-628-689-01 | Connector Plate |
| 22 | 4-963-911-01 | Compression Spring (MD1) (light gold) |
| 23 | 4-963-912-01 | Compression Spring (MD2) (silver) |
| 24 | 4-963-922-01 | Compression Spring (MD3) (black) |
| 25 | 4-963-924-01 | Screw (Damper) (light gold) |
| 26 | 7-621-284-20 | Screw P2.6x6 (for J1) (black) |
| | 7-682-135-01 | Screw P2.5x6 (for UC2, AE4, CEJ, CEK) (light gold) |
| 27 | 4-628-682-01 | Protection Sheet (Terminal) |

Mechanical Deck 1 (MT-MZR2 (A)-109)



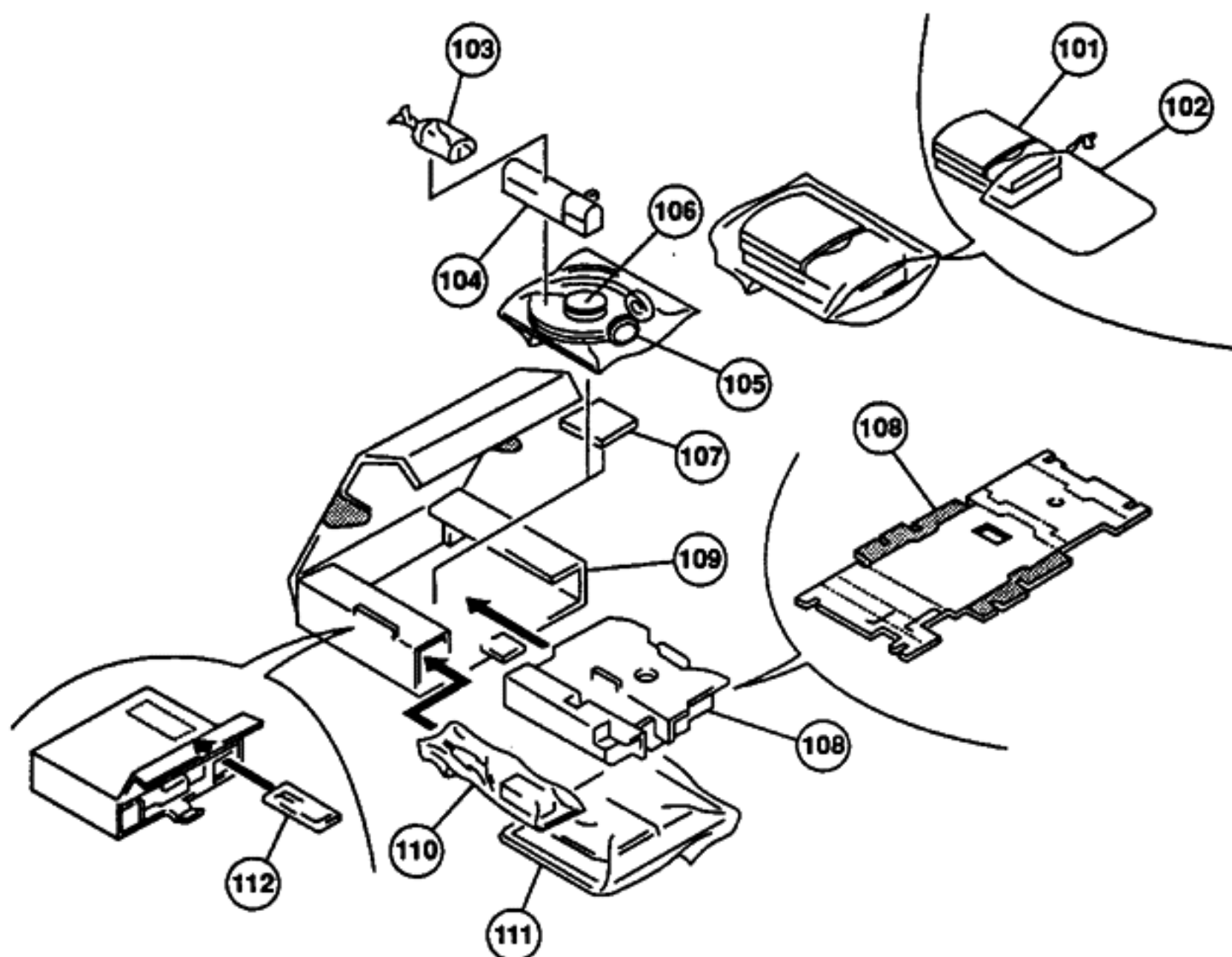
| <u>No.</u> | <u>Parts No.</u> | <u>Description</u> |
|------------|------------------|--|
| 51 | 3-366-890-11 | Locking Screw (M1.4) (black) |
| 52 | 3-704-197-33 | Locking Screw (M1.4x3.0) (black) |
| 53 | 4-963-883-31 | Precision Pan Screw (M1.4) (black) |
| 54 | 4-964-538-01 | Locking Screw (M1.4x2) (black) |
| 55 | 3-315-384-11 | Stopper Washer |
| 56 | X-4944-451-6 | Holder Ass'y |
| 57 | 4-964-223-01 | Insulation Sheet (for REC Mounted Board) |
| 58 | not supplied | REC Mounted Board |
| 59 | 1-651-016-11 | REC Flexible Cable |
| 60 | △ X-4620-953-1 | OP Head Ass'y |
| 61 | 1-651-018-11 | Sled Flexible Cable |
| 62 | 4-964-537-01 | Tapping Screw (M1.4x4.5) (black) |
| 63 | A-3300-218-A | Lead Screw Block Ass'y |
| 64 | 4-963-904-01 | Gear (B) |
| 65 | A-3300-219-A | Sled Motor Block Ass'y |
| 66 | 4-970-639-02 | Cover Sheet |
| 67 | 3-309-595-11 | Pack Insulation Sheet |
| 68 | * 4-963-889-02 | Head Guard |

Mechanical Deck 2 (MT-MZR2-109)



| <u>No.</u> | <u>Parts No.</u> | <u>Description</u> |
|------------|------------------|----------------------------------|
| 71 | 3-366-890-11 | Locking Screw (M1.4) (black) |
| 72 | A-3276-233-A | Mech Con Mounted Board |
| 73 | 4-955-841-01 | Locking Screw (M1.7x1.6) (black) |
| 74 | 1-651-017-11 | CLV Flexible Cable |
| 75 | 3-315-384-11 | Stopper Washer |
| 76 | 4-963-901-01 | Worm Gear |
| 77 | 4-963-902-01 | Compression Spring (Worm Wheel) |
| 78 | 4-964-564-01 | Screw (M1.2x1.6) (black) |
| 79 | 4-963-898-01 | Gear (Worm Gear) |
| 80 | X-4944-449-1 | Gear Chassis Ass'y |
| 81 | 1-651-015-11 | MD Flexible Cable |
| 82 | 4-963-900-01 | Tension Spring (Lock) |
| 83 | 1-698-313-11 | Motor |
| 84 | A-3300-216-A | Stepper Block Ass'y |
| 85 | 3-338-645-31 | Washer |

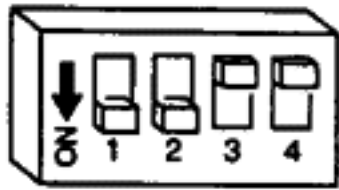
Packing Material



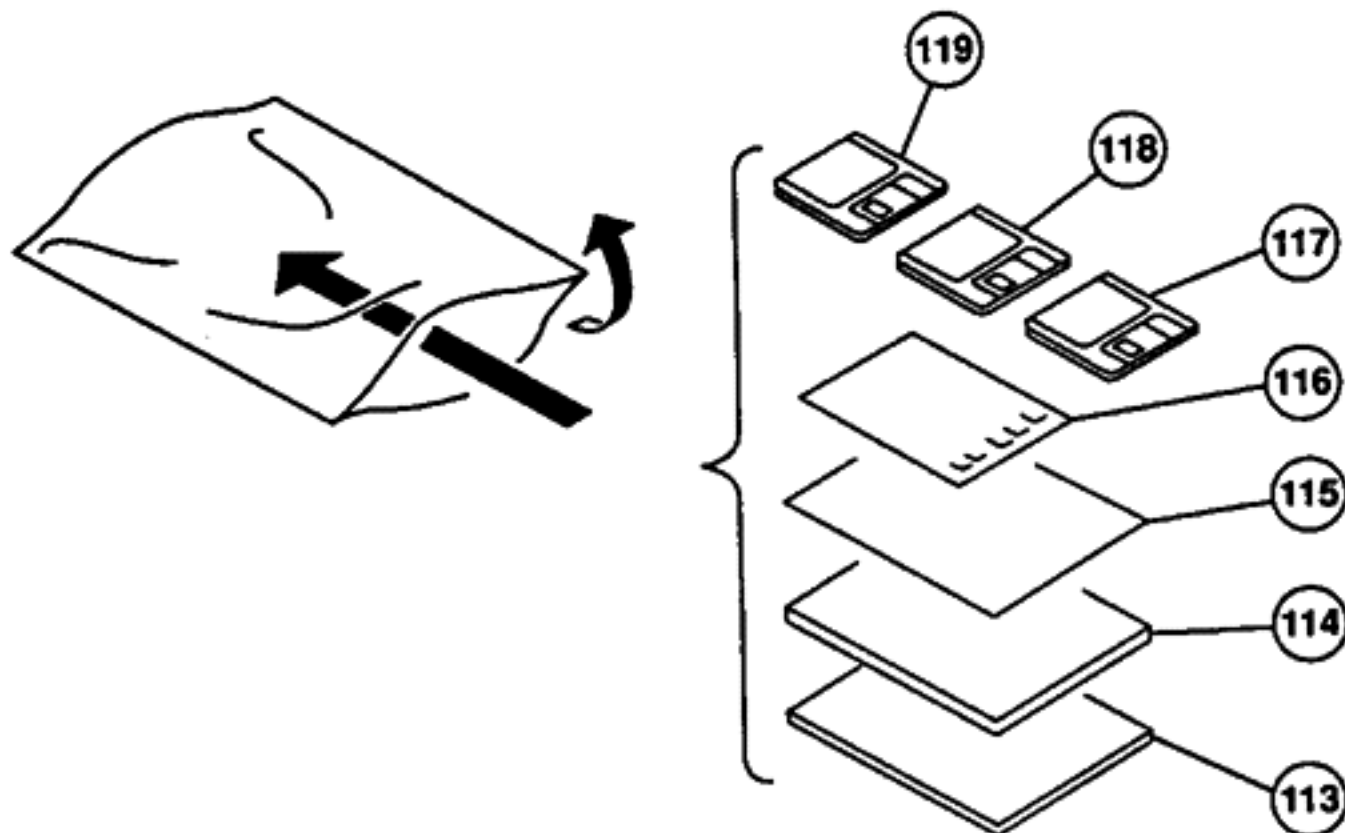
| No. | Parts No. | Description |
|-----|---------------------|---|
| 101 | Refer to Drive Unit | |
| 102 | 4-628-572-01 | Carrying Case |
| 103 | _____ | Lithium Ion Battery (LIP-12) |
| 104 | 1-528-575-11 | Battery Case |
| 105 | 8-953-537-94 | Headphone (MDR-E741MP/K2) (for J1) |
| | 8-953-009-90 | Headphone (MDR-014MP) (for UC2, CEJ, CEK) |
| 106 | 1-467-520-11 | Remote Control Unit |
| 107 | _____ | Disc (MMD-140 (UC)) (for UC2) |
| | _____ | Disc (MMD-140 (EJ)) (for J1, CEJ, CEK) |
| 108 | * 4-628-523-01 | Holder |
| 109 | * 4-628-522-01 | Individual Carton |
| 110 | Δ 1-473-017-11 | AC Adapter (for J1) |
| | Δ 1-473-018-11 | AC Adapter (for UC2) |
| | Δ 1-473-019-11 | AC Adapter (for CEJ) |
| | Δ 1-473-266-11 | AC Adapter (CEK) |
| 111 | _____ | Refer to Manual Ass'y |
| 112 | _____ | Warranty Card (for J1) |

6-1-2 Switches Setting for shipping

Be sure to set the Table 6-1-2 SCSI ID Switch to the original position as below for shipping.

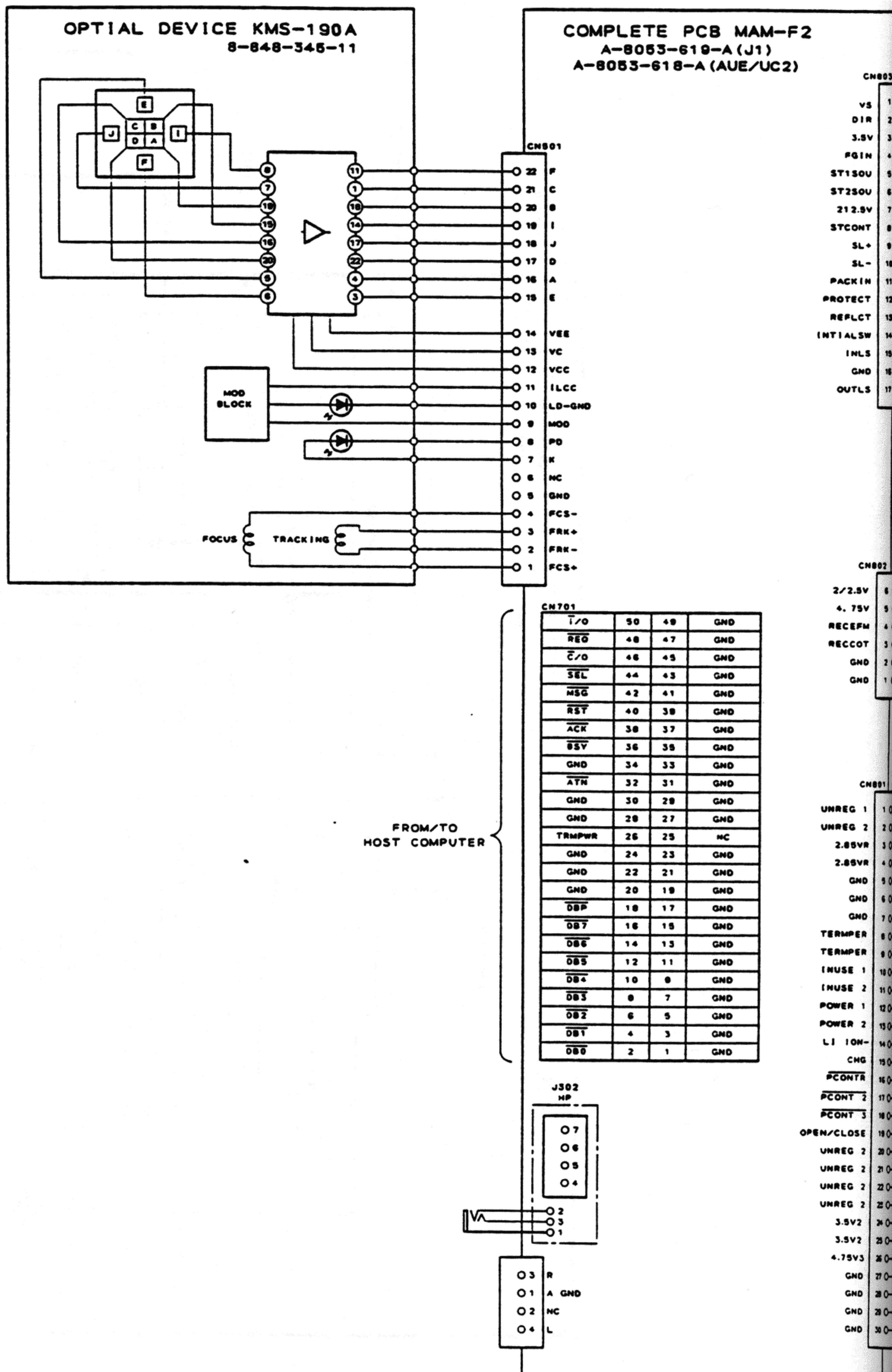
| Model Name | Setting |
|------------|---|
| MDH-10 | <div data-bbox="825 525 1153 708"></div> <div data-bbox="1161 736 1365 776">SCSI ID Select</div> <div data-bbox="1161 785 1306 825">Terminator</div> <div data-bbox="853 842 1306 885">POWER/Mode Select : Power OFF</div> <div data-bbox="853 879 1218 919">AVLS : OFF</div> |

Manual Ass'y

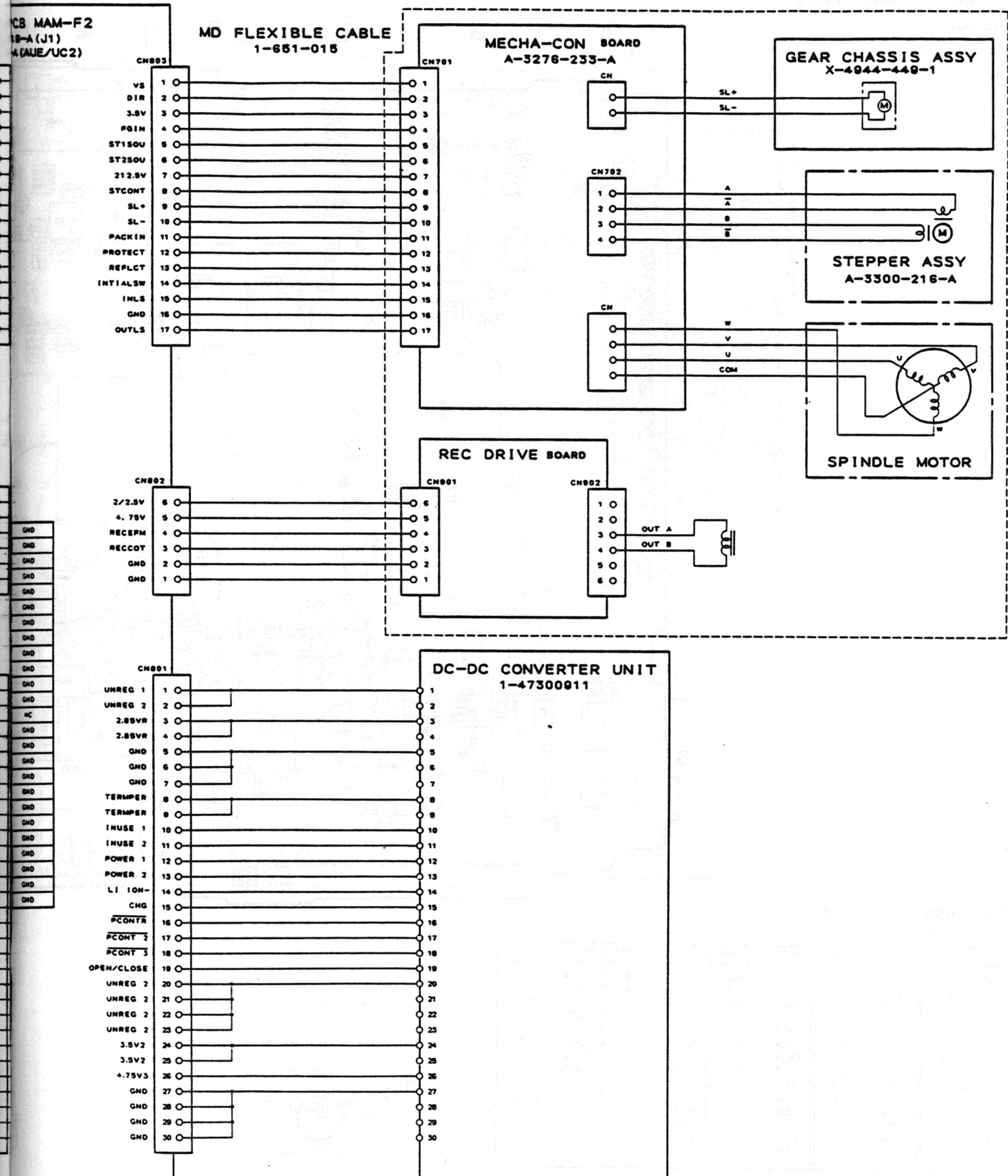


| <u>No.</u> | <u>Parts No.</u> | <u>Description</u> |
|------------|-------------------------------|--|
| 113 | _____ | License Contract |
| 114 | Δ 3-759-910-02 | Installation Manual (for J1) |
| | Δ 3-759-910-12 | Installation Manual (for CEJ) |
| | Δ 3-759-910-21 | Installation Manual (for UC2) |
| | Δ 3-759-910-22 | Installation Manual (for CEK) |
| 115 | _____ | Warranty Card (for UC2, CEJ) |
| 116 | _____ | Registration Card (for J1) |
| | _____ | Registration Card with envelope (for CEK, CEJ) |
| 117 | 4-628-518-01 /A-8043-720-A | Recorded Disk (MAC) |
| 118 | 4-628-517-02 /A-8043-719-A | Recorded Disk (DOS) |
| 119 | A-8043-760-A | Recorded Disk (NEC) (for J1) |

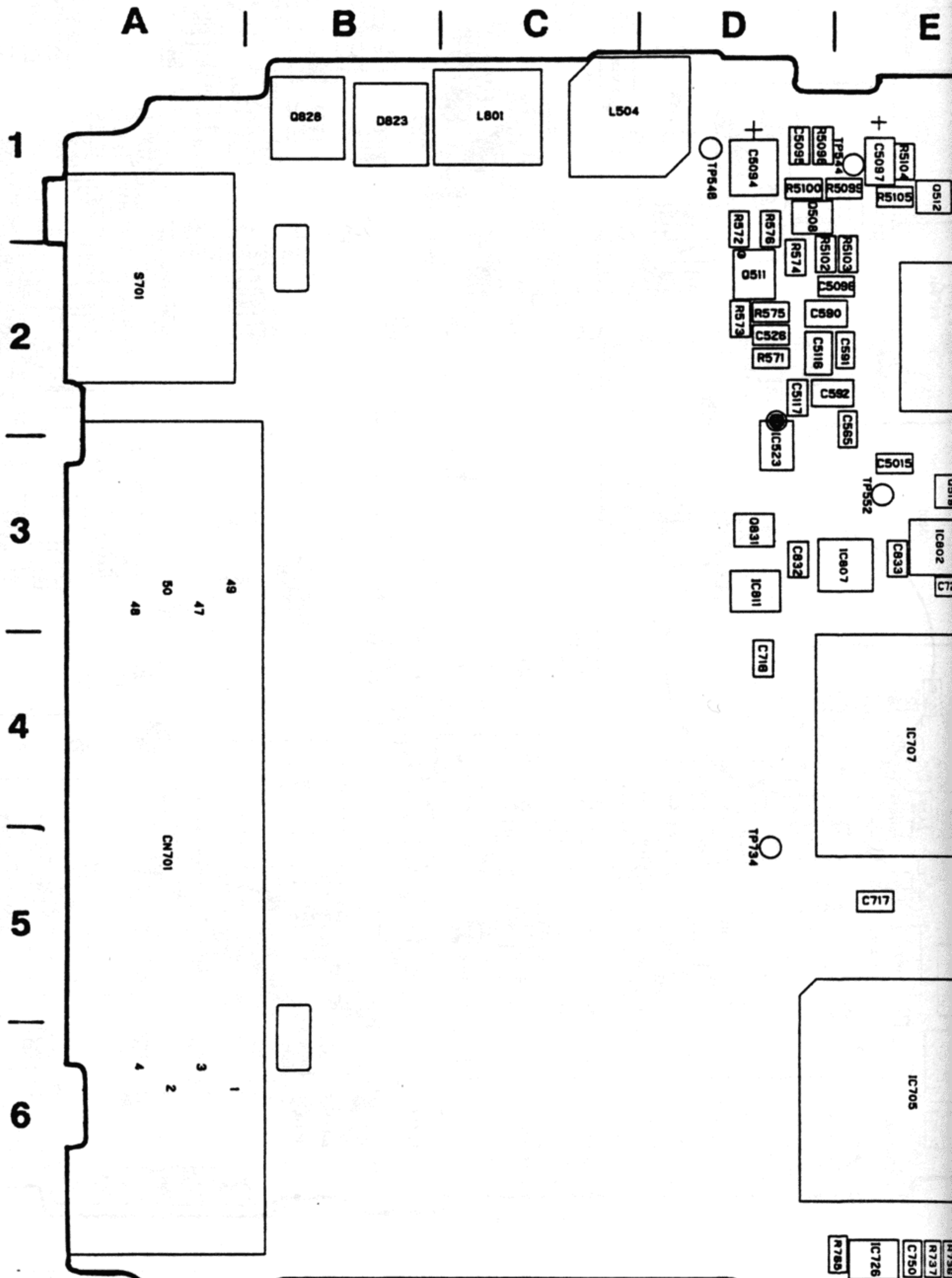
6-2-2 Interconnection Diagram



MECHA-DECK
1-651-015-11



— Pattern Side —

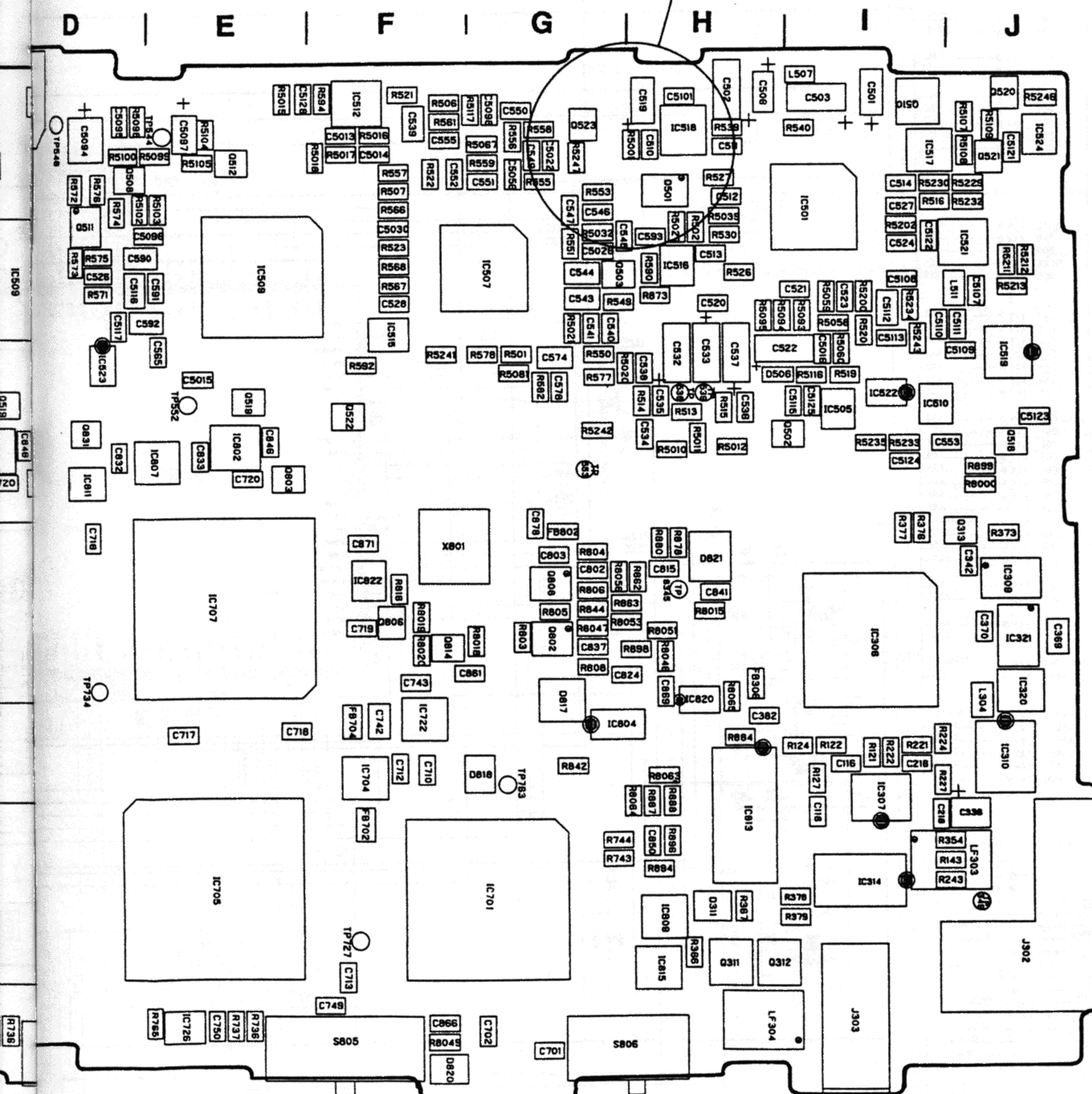


• Semiconductor Location

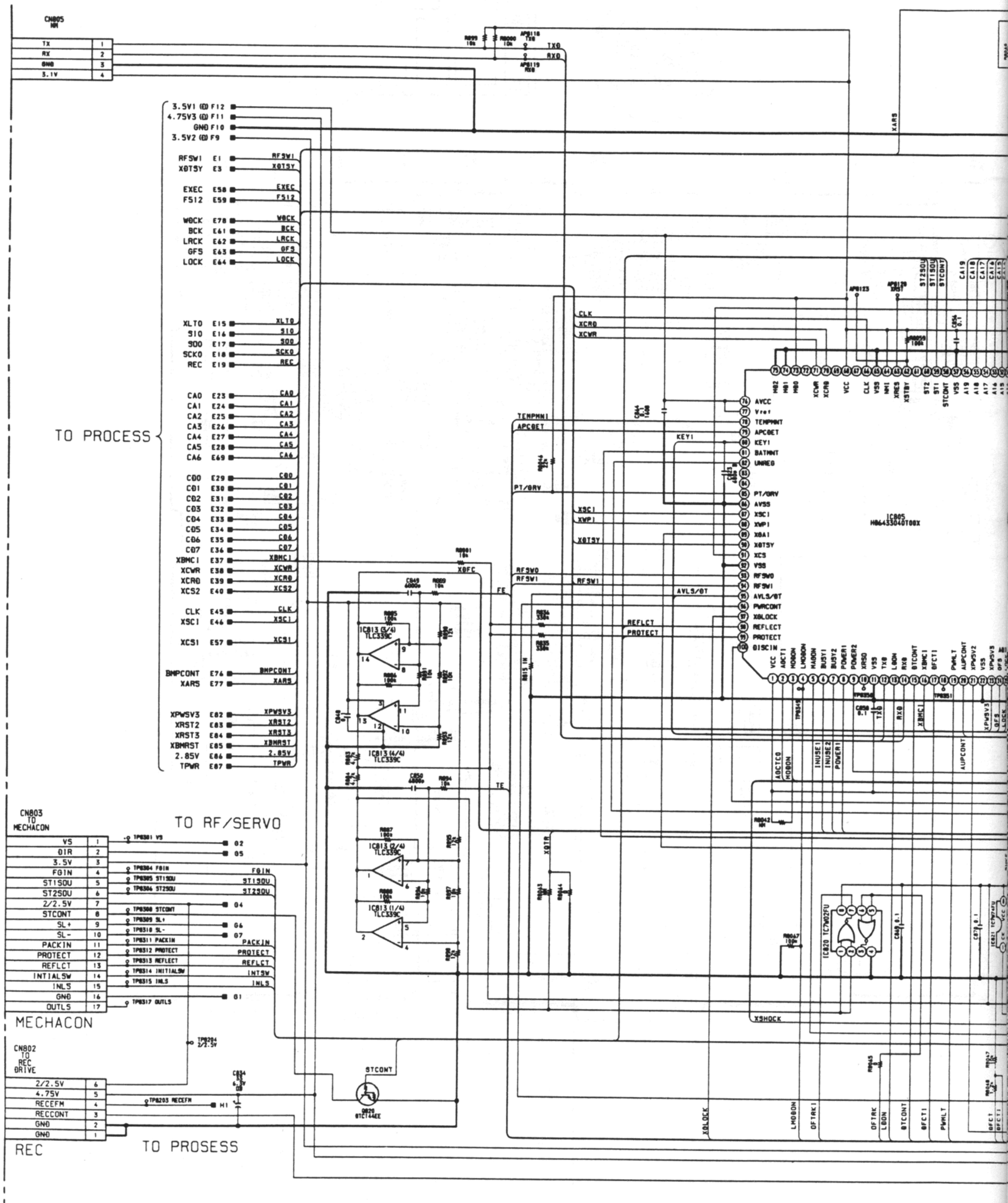
Pattern Side

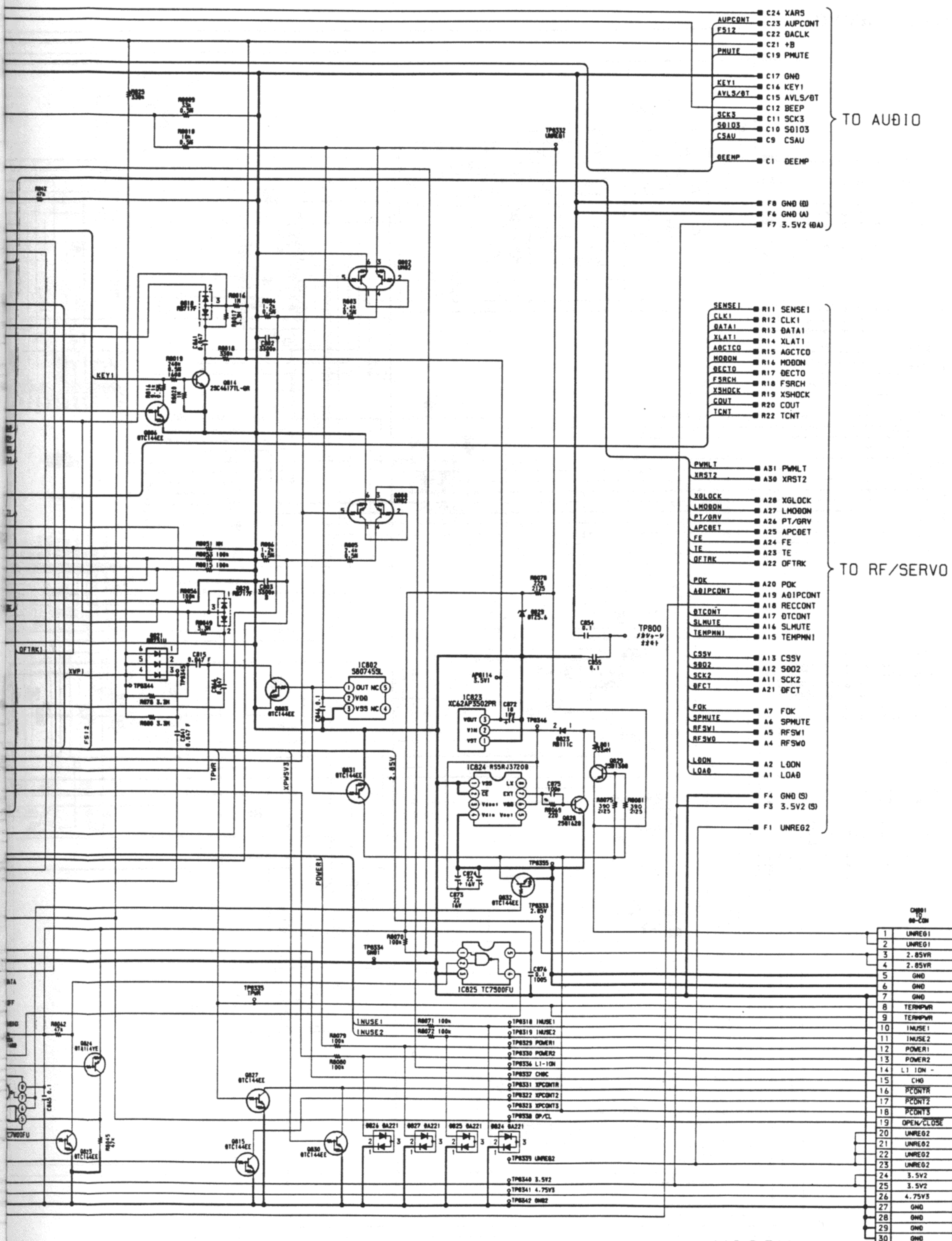
| Ref. No. | Location | Ref. No. | Location | Ref. No. | Location | Ref. No. | Location | Ref. No. | Location |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| D311 | H-6 | Q508 | D-1 | Q814 | F-4 | IC509 | E-2 | IC705 | E-6 |
| D506 | H-3 | Q510 | I-1 | Q828 | B-1 | IC510 | I-3 | IC707 | E-4 |
| D817 | G-5 | Q511 | D-2 | Q831 | D-3 | IC512 | F-1 | IC722 | F-5 |
| D818 | G-5 | Q512 | E-1 | | | IC515 | F-2 | IC726 | E-6 |
| D820 | F-6 | Q516 | J-3 | IC306 | I-4 | IC516 | H-2 | IC802 | E-3 |
| D821 | H-4 | Q519 | E-3 | IC307 | I-5 | IC517 | I-1 | IC804 | G-5 |
| D823 | B-1 | Q520 | J-1 | IC309 | J-4 | IC518 | H-1 | IC807 | E-3 |
| | | Q521 | J-1 | IC310 | J-5 | IC519 | J-2 | IC809 | H-6 |
| Q311 | H-6 | Q522 | F-3 | IC314 | I-6 | IC521 | J-2 | IC811 | D-3 |
| Q312 | H-6 | Q523 | G-1 | IC320 | J-5 | IC522 | I-3 | IC813 | H-5 |
| Q313 | J-4 | Q802 | G-4 | IC321 | J-4 | IC523 | D-3 | IC815 | H-6 |
| Q501 | H-1 | Q803 | E-3 | IC501 | I-2 | IC524 | J-1 | IC820 | H-5 |
| Q502 | I-3 | Q806 | F-4 | IC505 | I-3 | IC701 | G-6 | IC822 | F-4 |
| Q503 | G-2 | Q808 | G-4 | IC507 | G-2 | IC704 | F-5 | | |

to IC805/18pin of Component Side



Circuit Diagram (MICON)





- C24 XARS
- AUPCONT C23 AUPCONT
- FS12 C22 OACLK
- C21 +B
- PMUTE C19 PMUTE
- C17 GND
- KEY1 C16 KEY1
- AVLS/OT C15 AVLS/OT
- C12 BEEP
- SCK3 C11 SCK3
- S0103 C10 S0103
- CSAU C9 CSAU
- DEEMP C1 DEEMP
- F8 GND (B)
- F4 GND (A)
- F7 3.5V2 (BA)

TO AUDIO

- SENSE1 R11 SENSE1
- CLK1 R12 CLK1
- DATA1 R13 DATA1
- XLAT1 R14 XLAT1
- AGCTCO R15 AGCTCO
- MOBON R16 MOBON
- DECTO R17 DECTO
- FSRCH R18 FSRCH
- XSHOCK R19 XSHOCK
- COUT R20 COUT
- TCNT R22 TCNT

- PWMLT A31 PWMLT
- XRST2 A30 XRST2
- XGLOCK A28 XGLOCK
- LMOBON A27 LMOBON
- PT/GRV A26 PT/GRV
- APCDET A25 APCDET
- FE A24 FE
- TE A23 TE
- QFTRK A22 QFTRK

TO RF/SERVO

- POK A20 POK
- ADIPCONT A19 ADIPCONT
- RECCONT A18 RECCONT
- OTCONT A17 OTCONT
- SLMUTE A16 SLMUTE
- TEMPMN A15 TEMPMN
- CSSV A13 CSSV
- S002 A12 S002
- SCK2 A11 SCK2
- BFCT A21 BFCT

- FOK A7 FOK
- SPMUTE A6 SPMUTE
- RFSW1 A5 RFSW1
- RFSW0 A4 RFSW0
- LOON A2 LOON
- LOAB A1 LOAB

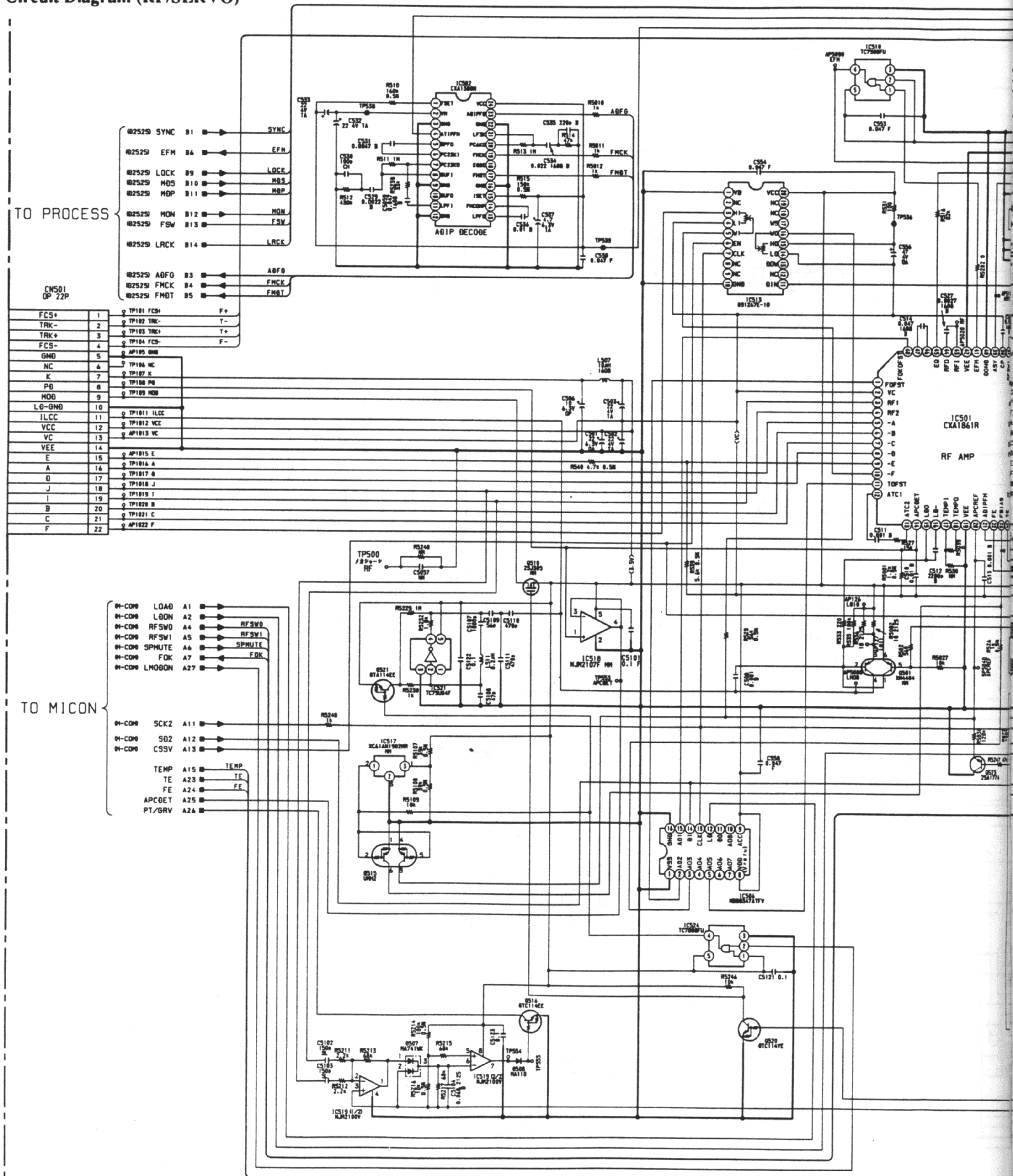
- F4 GND (S)
- F3 3.5V2 (S)
- F1 UNREG2

| CH001 | 00-CON |
|-------|------------|
| 1 | UNREG1 |
| 2 | UNREG1 |
| 3 | 2.85VR |
| 4 | 2.85VR |
| 5 | GND |
| 6 | GND |
| 7 | GND |
| 8 | TEMPWR |
| 9 | TEMPWR |
| 10 | INUSE1 |
| 11 | INUSE2 |
| 12 | POWER1 |
| 13 | POWER2 |
| 14 | L1 10N |
| 15 | CH0 |
| 16 | PCONTR |
| 17 | PCONT2 |
| 18 | PCONT3 |
| 19 | OPEN/CLOSE |
| 20 | UNREG2 |
| 21 | UNREG2 |
| 22 | UNREG2 |
| 23 | UNREG2 |
| 24 | 3.5V2 |
| 25 | 3.5V2 |
| 26 | 4.75V3 |
| 27 | GND |
| 28 | GND |
| 29 | GND |
| 30 | GND |

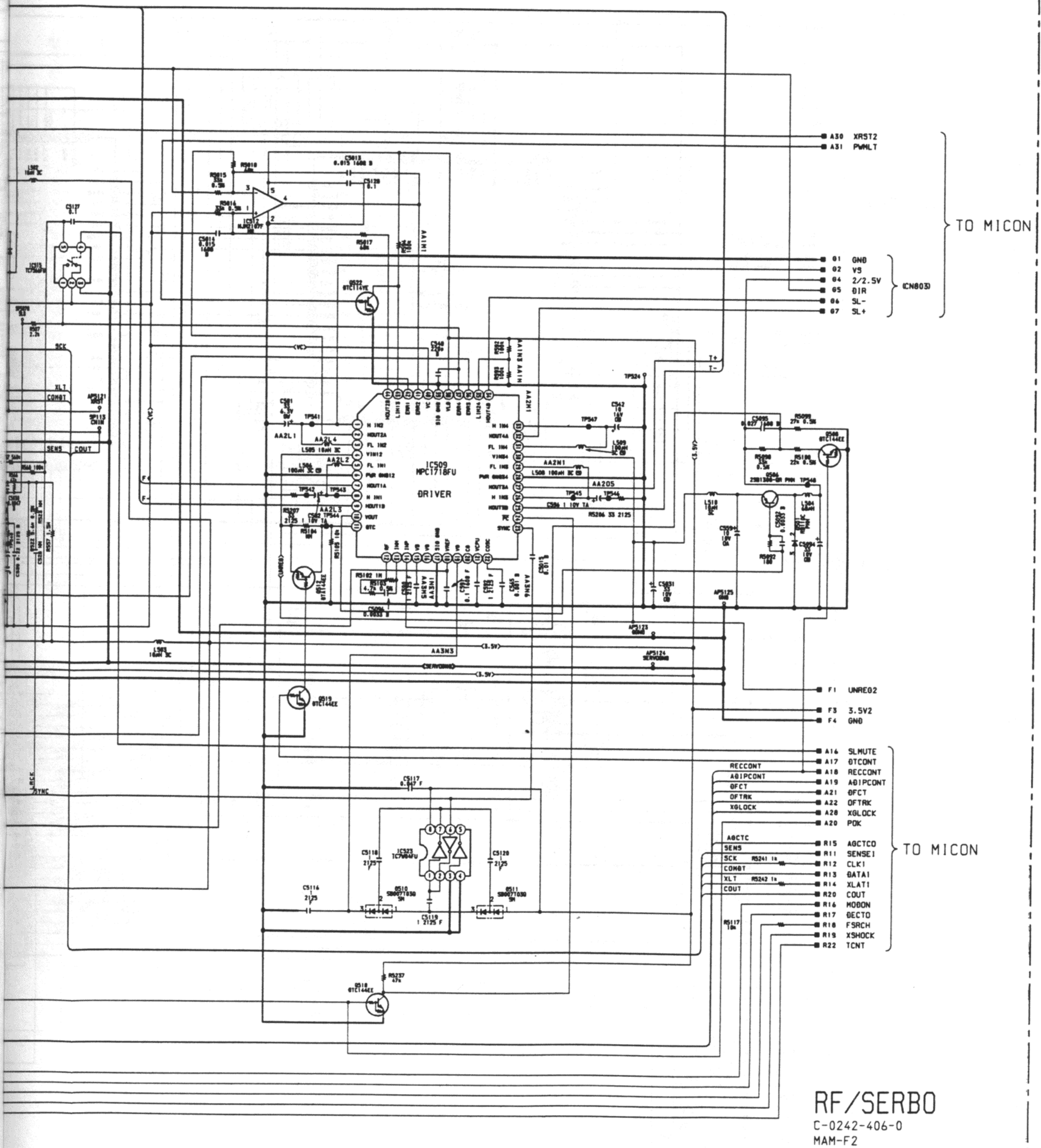
MICON
C-0242-406-0
MAM-F2

0/0.CON

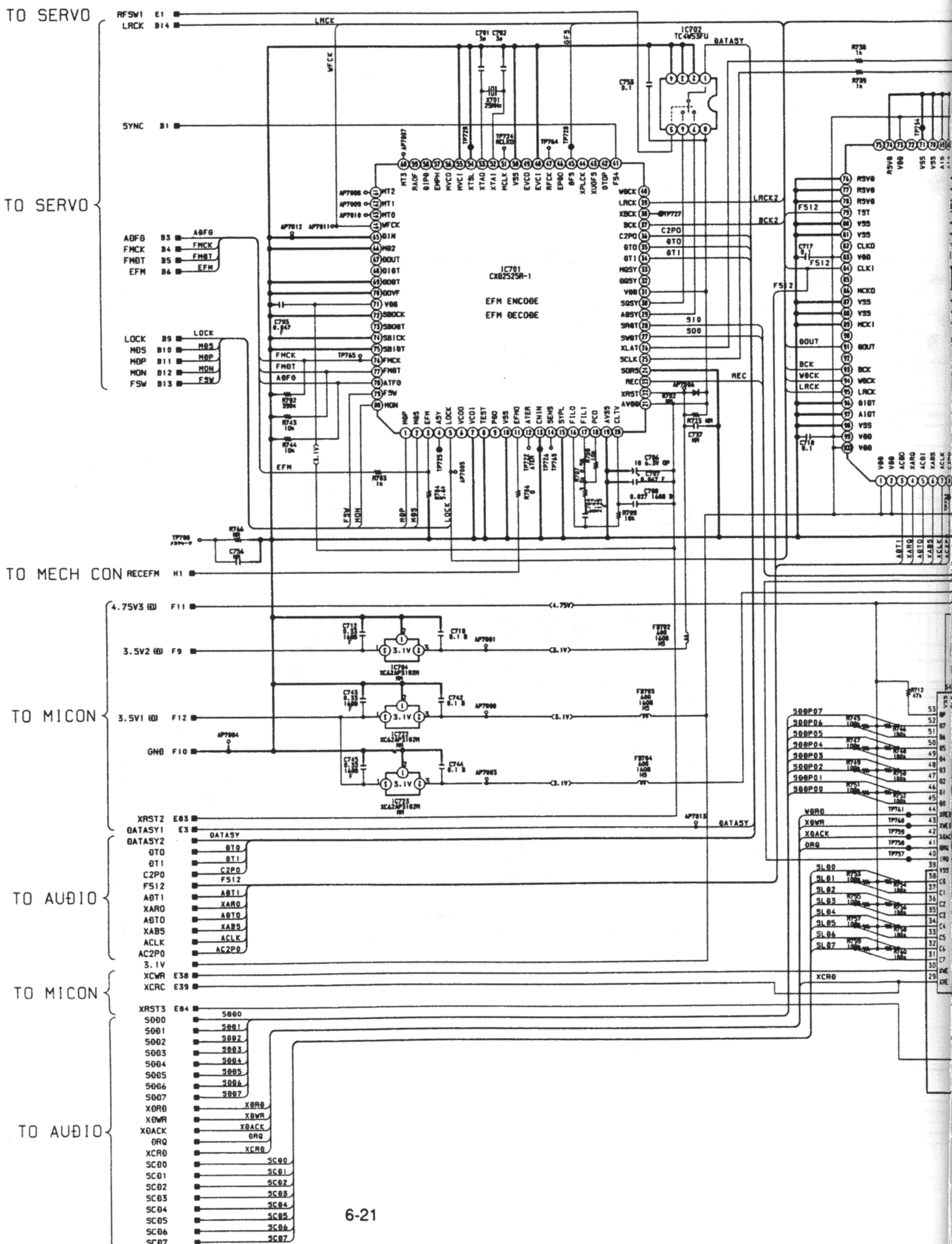
Circuit Diagram (RF/SERVO)

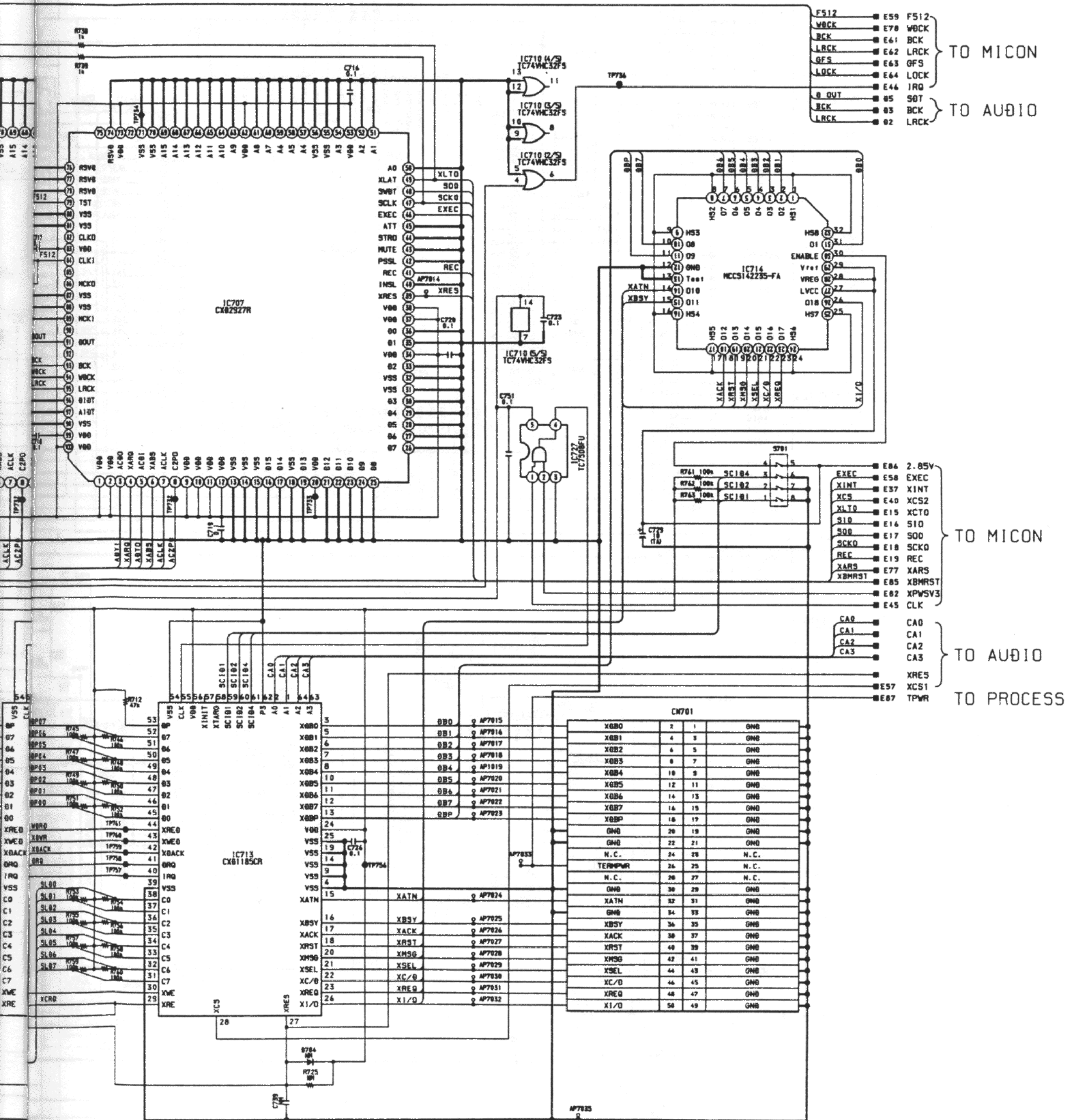




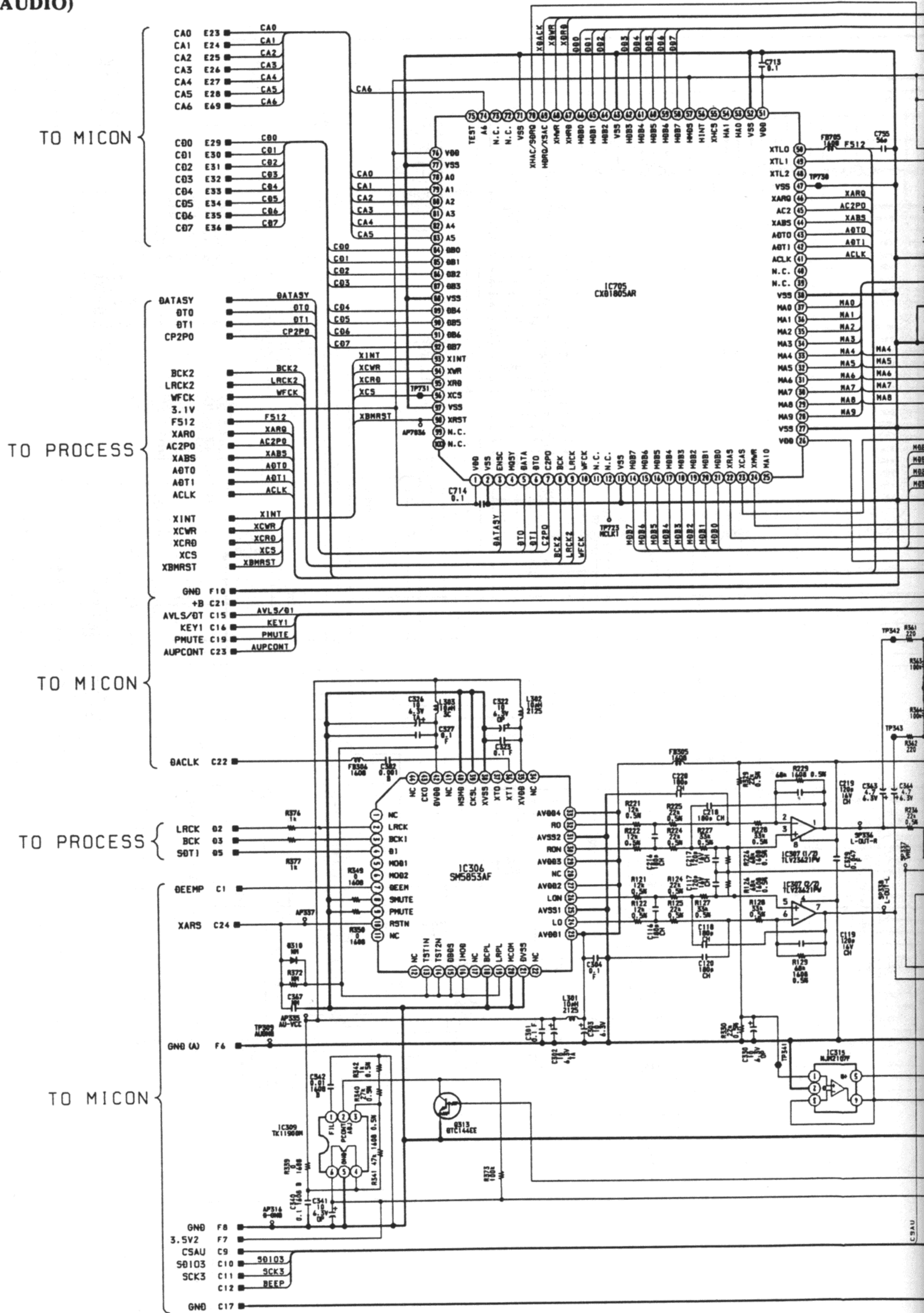


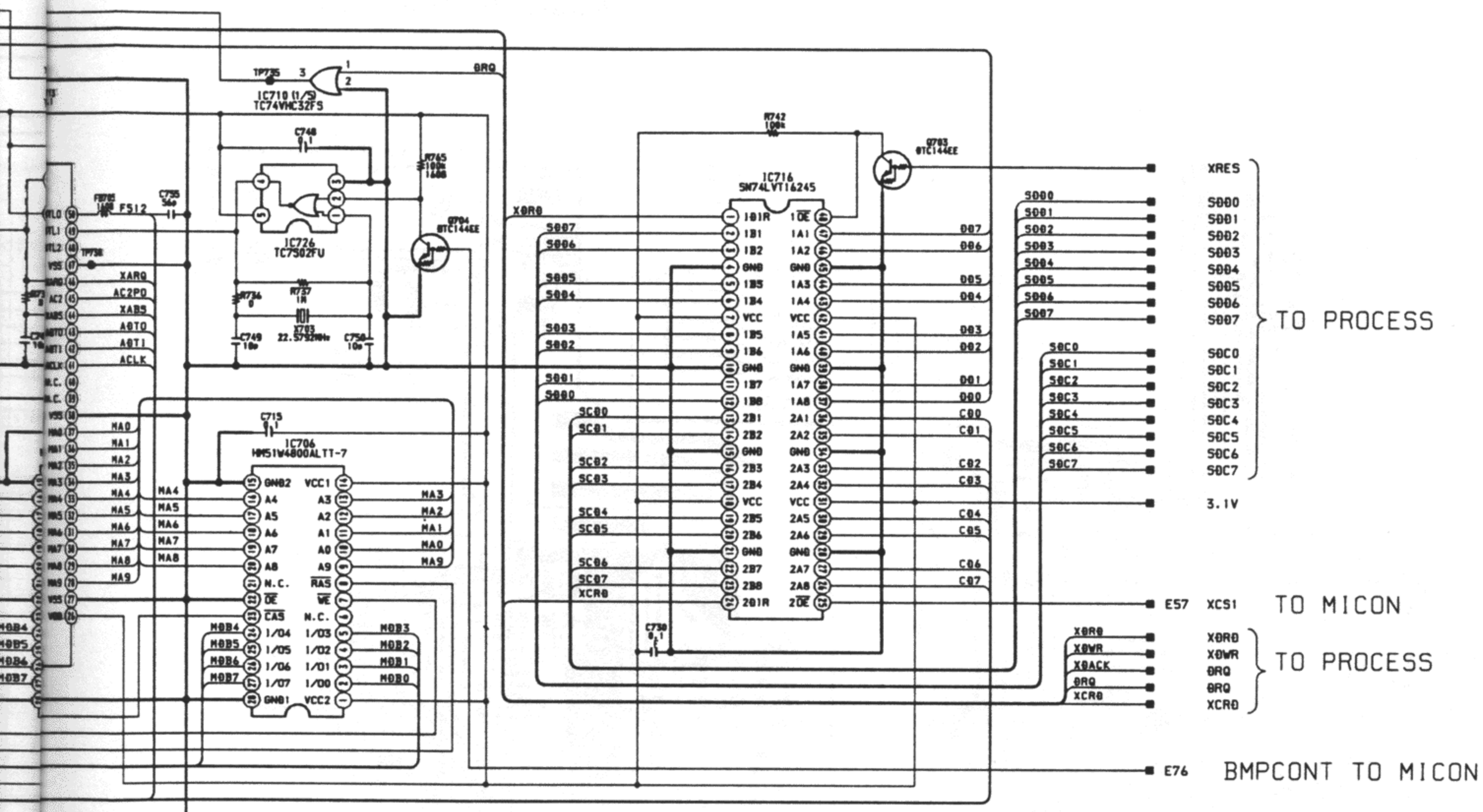
Circuit Diagram (PROCESS)

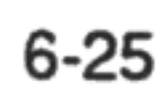




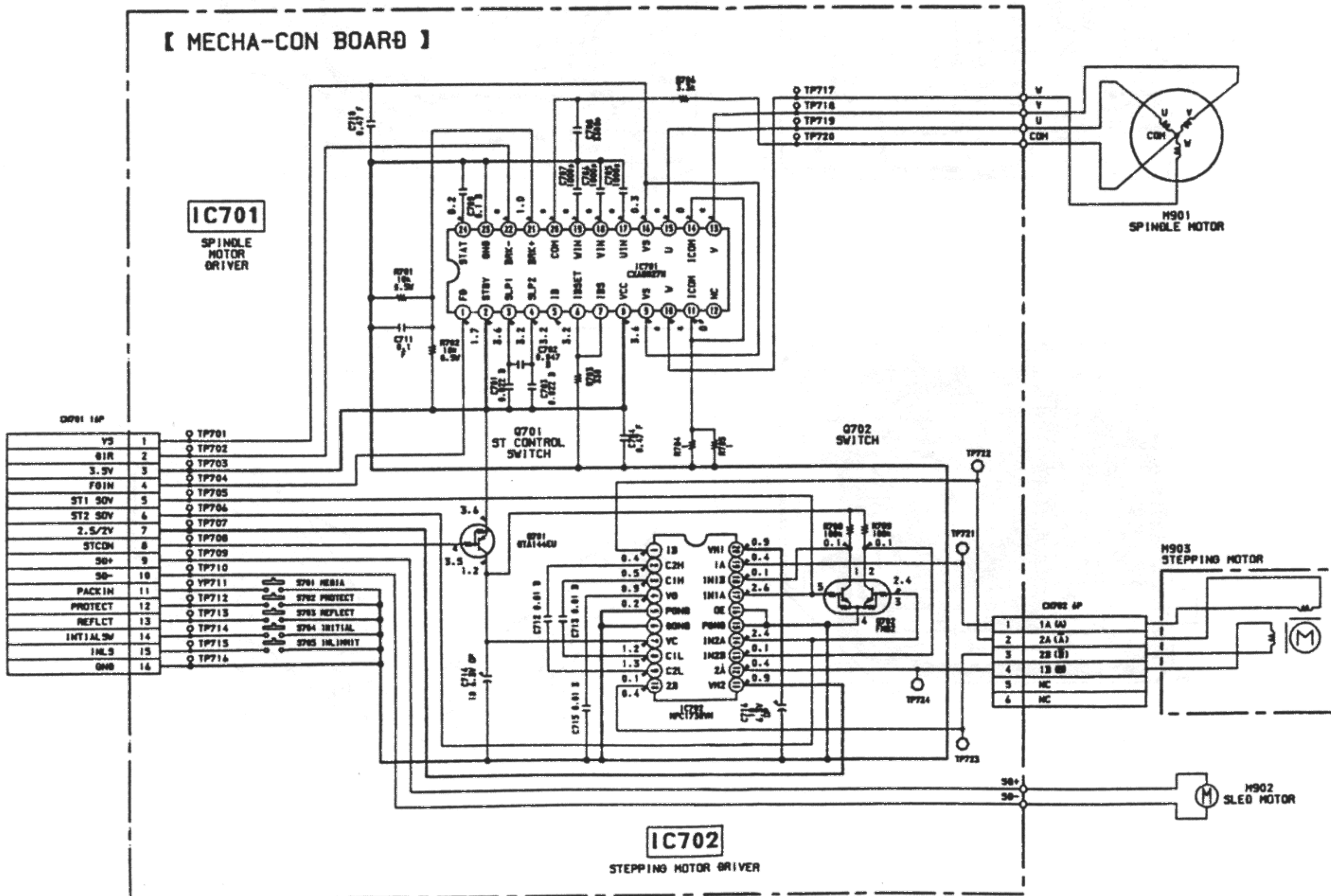
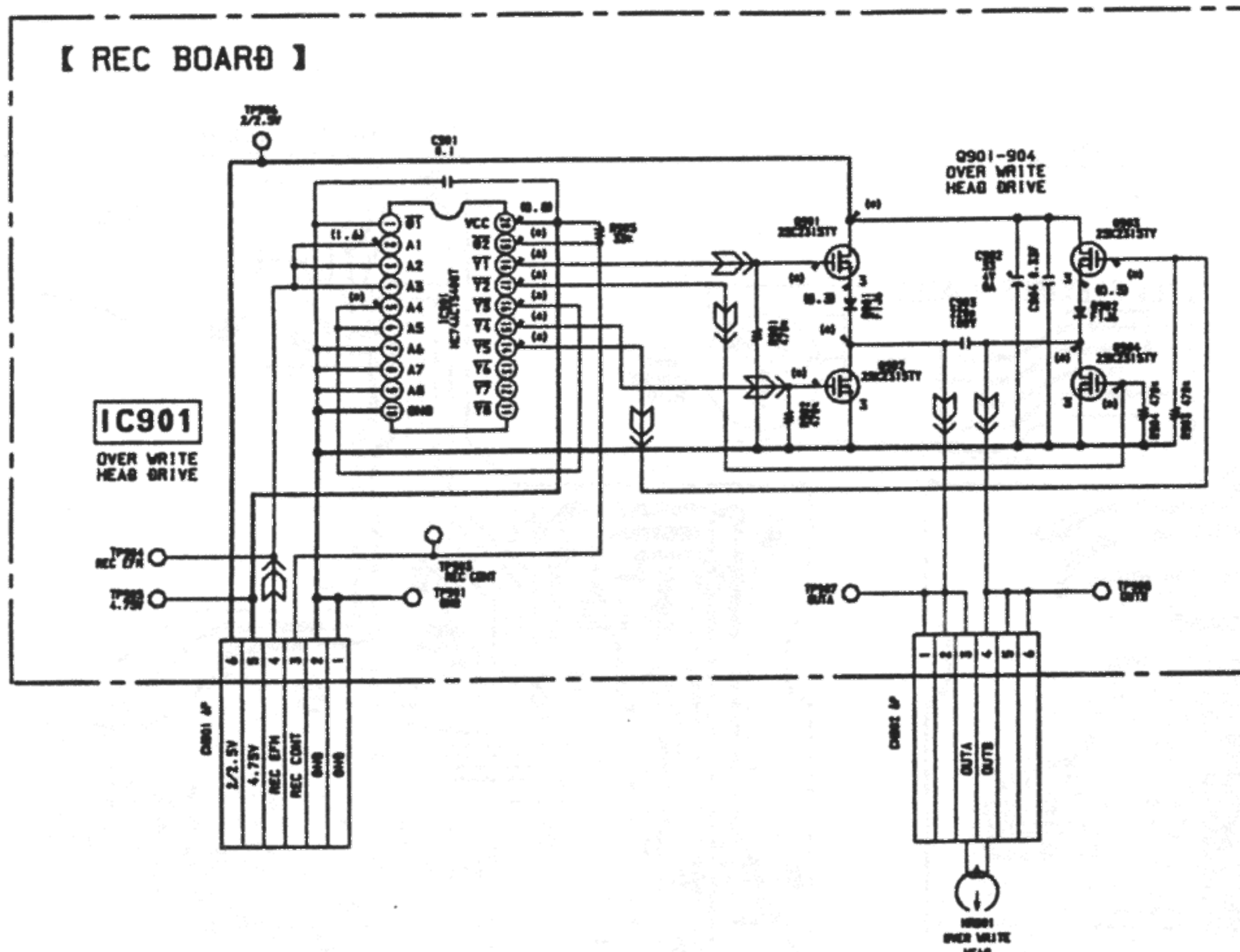
Circuit Diagram (AUDIO)







Circuit Diagram on REC and MECH-CON Mounted Board



6-4 ELECTRIC PARTS

ELECTRIC PARTS LIST

- Note: 1. All resistors are in ohms.
 2. "CHIP" stands for chip component.
 3. Items marked "*" are not stocked since they are seldom required for routine service.
 Some delay should be anticipated when ordering these items.
 4. All capacitors are in micro farads unless otherwise specified.
 5. All inductors are in micro henrys unless otherwise specified.

The components identified by mark Δ or dotted line with mark Δ are critical for safety. Replace only with part number specified.

| Ref. No. | Parts No. | Description | Ref. No. | Parts No. | Description |
|---|--------------|----------------------------|----------|--------------|-----------------------------|
| >>> MAM-F2 (E) MOUNTED BOARD (A-8053-805-A) <<< | | | C368 | 1-135-149-21 | TANTAL CHIP 2.2 10% 6.3V |
| >>> MAM-F2 (J) MOUNTED BOARD (A-8053-806-A) <<< | | | C369 | 1-163-038-91 | CERAMIC CHIP 0.1 25V |
| CAPACITORS | | | C370 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V |
| C116 | 1-164-218-11 | CERAMIC CHIP 180PF 5% 50V | C373 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C117 | 1-162-928-11 | CERAMIC CHIP 120PF 5% 50V | C374 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V |
| C118 | 1-164-218-11 | CERAMIC CHIP 180PF 5% 50V | C375 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V |
| C119 | 1-162-928-11 | CERAMIC CHIP 120PF 5% 50V | C376 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C120 | 1-164-218-11 | CERAMIC CHIP 180PF 5% 50V | C377 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V |
| C122 | 1-135-337-11 | TANTAL CHIP 1 20% 6.3V | C378 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V |
| C125 | 1-165-128-11 | CERAMIC CHIP 0.22 16V | C379 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 25V |
| C216 | 1-164-218-11 | CERAMIC CHIP 180PF 5% 50V | C380 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 25V |
| C217 | 1-162-928-11 | CERAMIC CHIP 120PF 5% 50V | C381 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 25V |
| C218 | 1-164-218-11 | CERAMIC CHIP 180PF 5% 50V | C382 | 1-162-964-91 | CERAMIC CHIP 0.001 10% 50V |
| C219 | 1-162-928-11 | CERAMIC CHIP 120PF 5% 50V | C501 | 1-104-929-11 | TANTAL CHIP 22 20% 6.3V |
| C220 | 1-164-218-11 | CERAMIC CHIP 180PF 5% 50V | C502 | 1-104-847-11 | TANTAL CHIP 22 20% 4V |
| C222 | 1-135-337-11 | TANTAL CHIP 1 20% 6.3V | C503 | 1-104-847-11 | TANTAL CHIP 22 20% 4V |
| C225 | 1-165-128-11 | CERAMIC CHIP 0.22 16V | C504 | 1-107-811-11 | TANTAL CHIP 47 20% 4V |
| C301 | 1-164-360-11 | CERAMIC CHIP 0.1 16V | C506 | 1-107-813-11 | TANTAL CHIP 10 20% 6.3V |
| C302 | 1-135-259-11 | TANTAL CHIP 10 20% 6.3V | C508 | 1-162-964-11 | CERAMIC CHIP 0.001 10% 50V |
| C303 | 1-135-259-11 | TANTAL CHIP 10 20% 6.3V | C509 | 1-107-811-11 | TANTAL CHIP 47 20% 4V |
| C304 | 1-164-360-11 | CERAMIC CHIP 0.1 16V | C510 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V |
| C305 | 1-164-227-11 | CERAMIC CHIP 0.022 10% 25V | C511 | 1-162-964-11 | CERAMIC CHIP 0.001 10% 50V |
| C322 | 1-107-813-11 | TANTAL CHIP 10 20% 6.3V | C512 | 1-162-966-11 | CERAMIC CHIP 0.0022 10% 50V |
| C323 | 1-164-360-11 | CERAMIC CHIP 0.1 16V | C513 | 1-162-964-11 | CERAMIC CHIP 0.001 10% 50V |
| C326 | 1-135-259-11 | TANTAL CHIP 10 20% 6.3V | C514 | 1-165-176-11 | CERAMIC CHIP 0.047 10% 16V |
| C327 | 1-164-360-11 | CERAMIC CHIP 0.1 16V | C519 | 1-104-929-11 | TANTAL CHIP 22 20% 6.3V |
| C329 | 1-164-361-11 | CERAMIC CHIP 0.047 16V | C520 | 1-162-964-11 | CERAMIC CHIP 0.001 10% 50V |
| C330 | 1-107-813-11 | TANTAL CHIP 10 20% 6.3V | C521 | 1-164-227-11 | CERAMIC CHIP 0.022 10% 16V |
| C333 | 1-164-360-11 | CERAMIC CHIP 0.1 16V | C522 | 1-135-191-21 | TANTAL CHIP 0.22 10% 20V |
| C334 | 1-104-847-11 | TANTAL CHIP 22 20% 4V | C523 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C335 | 1-104-847-11 | TANTAL CHIP 22 20% 4V | C524 | 1-164-677-11 | CERAMIC CHIP 0.033 10% 16V |
| C336 | 1-135-180-21 | TANTAL CHIP 3.3 20% 6.3V | C526 | 1-164-361-11 | CERAMIC CHIP 0.047 16V |
| C337 | 1-135-181-21 | TANTAL CHIP 4.7 20% 6.3V | C527 | 1-162-979-11 | CERAMIC CHIP 0.0027 10% 50V |
| C338 | 1-107-812-11 | TANTAL CHIP 4.7 20% 6.3V | C529 | 1-162-966-11 | CERAMIC CHIP 0.0022 10% 50V |
| C340 | 1-164-004-11 | CERAMIC CHIP 0.1 10% 16V | C530 | 1-162-927-11 | CERAMIC CHIP 100PF 5% 50V |
| C341 | 1-107-813-11 | TANTAL CHIP 10 20% 6.3V | C531 | 1-162-968-11 | CERAMIC CHIP 0.0047 10% 50V |
| C342 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V | C532 | 1-104-847-11 | TANTAL CHIP 22 20% 4V |
| C343 | 1-164-326-91 | CERAMIC CHIP 0.47 16V | C533 | 1-104-847-11 | TANTAL CHIP 22 20% 4V |
| C351 | 1-164-361-11 | CERAMIC CHIP 0.047 16V | C534 | 1-164-227-11 | CERAMIC CHIP 0.022 10% 16V |
| C352 | 1-164-361-11 | CERAMIC CHIP 0.047 16V | C535 | 1-162-960-11 | CERAMIC CHIP 220PF 10% 50V |
| C354 | 1-107-816-11 | TANTAL CHIP 0.68 20% 10V | C536 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V |
| C360 | 1-164-363-11 | CERAMIC CHIP 560PF 5% 50V | C537 | 1-135-181-21 | TANTAL CHIP 4.7 20% 6.3V |
| C361 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V | C538 | 1-164-361-11 | CERAMIC CHIP 0.047 16V |
| C362 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 16V | C539 | 1-164-489-11 | CERAMIC CHIP 0.22 10% 16V |
| C363 | 1-107-812-11 | TANTAL CHIP 4.7 20% 6.3V | C540 | 1-165-112-11 | CERAMIC CHIP 0.33 16V |
| C364 | 1-107-812-11 | TANTAL CHIP 4.7 20% 6.3V | C541 | 1-162-968-11 | CERAMIC CHIP 0.0047 10% 50V |
| | | | C542 | 1-104-813-11 | TANTAL CHIP 10 20% 16V |

| Ref. No. | Parts No. | Description | | | | | | | |
|----------|--------------|--------------|--------|--------|------|--|--|--|--|
| C543 | 1-164-005-11 | CERAMIC CHIP | 0.47 | | 25V | | | | |
| C544 | 1-164-005-11 | CERAMIC CHIP | 0.47 | | 25V | | | | |
| C545 | 1-162-964-11 | CERAMIC CHIP | 0.001 | 10% | 50V | | | | |
| C546 | 1-165-176-11 | CERAMIC CHIP | 0.047 | 10% | 16V | | | | |
| C547 | 1-162-927-11 | CERAMIC CHIP | 100PF | 5% | 50V | | | | |
| C548 | 1-162-960-11 | CERAMIC CHIP | 220PF | 10% | 50V | | | | |
| C549 | 1-164-490-11 | CERAMIC CHIP | 0.068 | | 16V | | | | |
| C550 | 1-164-677-11 | CERAMIC CHIP | 0.033 | 10% | 16V | | | | |
| C551 | 1-162-952-11 | CERAMIC CHIP | 82PF | 5% | 50V | | | | |
| C552 | 1-164-826-91 | CERAMIC CHIP | 0.1 | 10% | 16V | | | | |
| C553 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C554 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C555 | 1-162-927-11 | CERAMIC CHIP | 100PF | 5% | 50V | | | | |
| C556 | 1-107-811-11 | TANTAL CHIP | 47 | 20% | 4V | | | | |
| C558 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C559 | 1-135-263-21 | TANTAL CHIP | 10 | 20% | 10V | | | | |
| C561 | 1-104-929-11 | TANTAL CHIP | 22 | 20% | 6.3V | | | | |
| C565 | 1-162-964-11 | CERAMIC CHIP | 0.001 | 10% | 50V | | | | |
| C570 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C572 | 1-104-929-11 | TANTAL CHIP | 22 | 20% | 6.3V | | | | |
| C574 | 1-164-005-11 | CERAMIC CHIP | 0.47 | | 25V | | | | |
| C578 | 1-164-677-11 | CERAMIC CHIP | 0.033 | 10% | 16V | | | | |
| C581 | 1-135-246-11 | TANTAL CHIP | 33 | 20% | 6.3V | | | | |
| C582 | 1-135-208-11 | TANTAL CHIP | 1 | 10% | 10V | | | | |
| C590 | 1-164-346-11 | CERAMIC CHIP | 1 | | 16V | | | | |
| C591 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C592 | 1-164-346-11 | CERAMIC CHIP | 1 | | 16V | | | | |
| C593 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C596 | 1-135-208-11 | TANTAL CHIP | 1 | 10% | 10V | | | | |
| C701 | 1-162-908-11 | CERAMIC CHIP | 3PF | 0.25PF | 50V | | | | |
| C702 | 1-162-908-11 | CERAMIC CHIP | 3PF | 0.25PF | 50V | | | | |
| C703 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C704 | 1-164-005-11 | CERAMIC CHIP | 0.47 | | 25V | | | | |
| C706 | 1-107-813-11 | TANTAL CHIP | 10 | 20% | 6.3V | | | | |
| C707 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C708 | 1-104-700-11 | CERAMIC CHIP | 0.027 | 10% | 16V | | | | |
| C710 | 1-164-004-11 | CERAMIC CHIP | 0.1 | 10% | 16V | | | | |
| C712 | 1-165-112-11 | CERAMIC CHIP | 0.33 | | 16V | | | | |
| C713 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C714 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C715 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C716 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C717 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C718 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C719 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C720 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C723 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C726 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C729 | 1-135-263-21 | TANTAL CHIP | 10 | 20% | 10V | | | | |
| C730 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C742 | 1-216-864-91 | CERAMIC CHIP | 0.1 | 10% | 16V | | | | |
| C743 | 1-165-112-11 | CERAMIC CHIP | 0.33 | | 16V | | | | |
| C744 | 1-164-004-11 | CERAMIC CHIP | 0.1 | 10% | 16V | | | | |
| C745 | 1-165-112-11 | CERAMIC CHIP | 0.33 | | 16V | | | | |
| C748 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C749 | 1-162-915-11 | CERAMIC CHIP | 10PF | 0.5PF | 50V | | | | |
| C750 | 1-162-915-11 | CERAMIC CHIP | 10PF | 0.5PF | 50V | | | | |
| C751 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C753 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C755 | 1-162-950-11 | CERAMIC CHIP | 56PF | 5% | 50V | | | | |
| C802 | 1-162-967-11 | CERAMIC CHIP | 0.0033 | 10% | 50V | | | | |
| C803 | 1-162-967-11 | CERAMIC CHIP | 0.0033 | 10% | 50V | | | | |
| C806 | 1-162-970-11 | CERAMIC CHIP | 0.01 | 10% | 16V | | | | |
| C815 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C823 | 1-162-963-11 | CERAMIC CHIP | 680PF | 10% | 50V | | | | |
| C824 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C832 | 1-162-964-91 | CERAMIC CHIP | 0.33 | | 16V | | | | |
| C833 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C834 | 1-104-630-11 | TANTAL CHIP | 33 | 20% | 6.3V | | | | |
| C837 | 1-165-112-11 | CERAMIC CHIP | 0.33 | | 16V | | | | |
| C840 | 1-165-112-11 | CERAMIC CHIP | 0.33 | | 16V | | | | |
| C841 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C846 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C848 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C849 | 1-162-969-11 | CERAMIC CHIP | 0.0068 | 10% | 25V | | | | |
| C850 | 1-162-970-11 | CERAMIC CHIP | 0.01 | 10% | 25V | | | | |
| C853 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C854 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C855 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C856 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C857 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C858 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C861 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C862 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C863 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C864 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C865 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C866 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C867 | 1-162-966-11 | CERAMIC CHIP | 0.0022 | 10% | 50V | | | | |
| C868 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C869 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C870 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C871 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C872 | 1-135-263-21 | TANTAL CHIP | 10 | 20% | 10V | | | | |
| C873 | 1-110-574-11 | TANTAL CHIP | 22 | 20% | 16V | | | | |
| C874 | 1-110-574-11 | TANTAL CHIP | 22 | 20% | 16V | | | | |
| C875 | 1-162-927-11 | CERAMIC CHIP | 100PF | 5% | 50V | | | | |
| C876 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C877 | 1-162-950-11 | CERAMIC CHIP | 56PF | 5% | 50V | | | | |
| C878 | 1-162-949-11 | CERAMIC CHIP | 47PF | 5% | 50V | | | | |
| C5013 | 1-164-245-11 | CERAMIC CHIP | 0.015 | 10% | 25V | | | | |
| C5014 | 1-164-245-11 | CERAMIC CHIP | 0.015 | 10% | 25V | | | | |
| C5015 | 1-162-970-11 | CERAMIC CHIP | 0.01 | 10% | 16V | | | | |
| C5016 | 1-164-361-11 | CERAMIC CHIP | 0.047 | | 16V | | | | |
| C5022 | 1-164-363-11 | CERAMIC CHIP | 560PF | 5% | 50V | | | | |
| C5026 | 1-162-962-11 | CERAMIC CHIP | 470PF | 10% | 50V | | | | |
| C5030 | 1-162-968-11 | CERAMIC CHIP | 0.0047 | 10% | 50V | | | | |
| C5031 | 1-107-814-11 | TANTAL CHIP | 33 | 20% | 10V | | | | |
| C5056 | 1-162-962-11 | CERAMIC CHIP | 470PF | 10% | 50V | | | | |
| C5059 | 1-165-176-11 | CERAMIC CHIP | 0.047 | 10% | 16V | | | | |
| C5092 | 1-162-967-11 | CERAMIC CHIP | 0.0033 | 10% | 50V | | | | |
| C5094 | 1-107-814-11 | TANTAL CHIP | 33 | 20% | 10V | | | | |
| C5095 | 1-104-700-11 | CERAMIC CHIP | 0.027 | 10% | 16V | | | | |
| C5096 | 1-162-967-11 | CERAMIC CHIP | 0.0033 | 10% | 50V | | | | |
| C5098 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C5101 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V | | | | |
| C5102 | 1-162-955-11 | CERAMIC CHIP | 150PF | 5% | 50V | | | | |
| C5103 | 1-162-955-11 | CERAMIC CHIP | 150PF | 5% | 50V | | | | |
| C5104 | 1-164-344-11 | CERAMIC CHIP | 0.068 | 10% | 25V | | | | |
| C5107 | 1-162-964-11 | CERAMIC CHIP | 0.001 | 10% | 50V | | | | |

| Ref. No. | Parts No. | Description |
|----------|--------------|---------------------------|
| C5108 | 1-162-949-11 | CERAMIC CHIP 47PF 5% 50V |
| C5109 | 1-162-950-11 | CERAMIC CHIP 56PF 5% 50V |
| C5110 | 1-164-362-11 | CERAMIC CHIP 470PF 5% 50V |
| C5111 | 1-164-362-11 | CERAMIC CHIP 470PF 5% 50V |
| C5112 | 1-164-005-11 | CERAMIC CHIP 0.47 25V |
| C5113 | 1-162-970-11 | CERAMIC CHIP 0.01 10% 25V |
| C5116 | 1-164-346-11 | CERAMIC CHIP 1 16V |
| C5117 | 1-164-361-11 | CERAMIC CHIP 0.047 16V |
| C5118 | 1-164-346-11 | CERAMIC CHIP 1 16V |
| C5119 | 1-164-346-11 | CERAMIC CHIP 1 16V |
| C5120 | 1-164-346-11 | CERAMIC CHIP 1 16V |
| C5121 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C5122 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C5123 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C5124 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C5125 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C5126 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C5127 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |
| C5128 | 1-164-360-11 | CERAMIC CHIP 0.1 16V |

CONNECTORS

| | | |
|-------|--------------|---|
| CN501 | 1-573-831-11 | CONNECTOR, FFC/FPC (ZIF) 22P |
| CN701 | 1-770-231-11 | PIN, CONNECTOR (HALF PITCH) 50P (for MAM-F2 (E)) |
| | 1-770-230-11 | SOCKET, CONNECTOR 50P (for MAM-F2 (J)) |
| CN801 | 1-573-939-11 | CONNECTOR, FFC/FPC (ZIF) 30P |
| CN802 | 1-573-346-21 | CONNECTOR, FFC/FPC 6P |
| CN803 | 1-573-357-11 | CONNECTOR, FFC/FPC 17P |

DIODES

| | | |
|------|--------------|-------------------|
| D302 | 8-719-046-90 | DIODE MA2S111-TX |
| D303 | 8-719-046-88 | DIODE MA2S082-TX |
| D304 | 8-719-046-88 | DIODE MA2S082-TX |
| D305 | 8-719-046-88 | DIODE MA2S082-TX |
| D311 | 8-719-800-76 | DIODE 1SS226 |
| D501 | 8-719-975-33 | DIODE RB110C |
| D507 | 8-719-047-55 | DIODE MA741WK |
| D508 | 8-719-404-46 | DIODE MA110 |
| D510 | 8-719-023-69 | DIODE SB007T03Q |
| D511 | 8-719-023-69 | DIODE SB007T03Q |
| D817 | 8-719-400-18 | DIODE MA152WK |
| D818 | 8-719-989-08 | DIODE RB717F |
| D819 | 8-719-045-67 | DIODE RB731U-T108 |
| D820 | 8-719-989-08 | DIODE RB717F |
| D821 | 8-719-045-67 | DIODE RB731U-T108 |
| D822 | 8-719-989-03 | DIODE DNA222 |
| D823 | 8-719-049-40 | DIODE RB111C |
| D824 | 8-719-989-00 | DIODE DA221 |
| D825 | 8-719-989-00 | DIODE DA221 |
| D826 | 8-719-989-00 | DIODE DA221 |
| D827 | 8-719-989-00 | DIODE DA221 |
| D829 | 8-719-977-03 | DIODE DTZ5.6 |

FUSE

| | | |
|-------|--------------|------------------------|
| FB301 | 1-414-228-11 | INDUCTOR, FERRITE BEAD |
| FB302 | 1-414-228-11 | INDUCTOR, FERRITE BEAD |
| FB303 | 1-414-228-11 | INDUCTOR, FERRITE BEAD |
| FB304 | 1-414-228-11 | INDUCTOR, FERRITE BEAD |
| FB305 | 1-500-215-11 | BEAD, FERRITE (CHIP) |

| Ref. No. | Parts No. | Description |
|----------|--------------|------------------------|
| FB306 | 1-500-215-11 | BEAD, FERRITE (CHIP) |
| FB702 | 1-414-228-11 | INDUCTOR, FERRITE BEAD |
| FB703 | 1-414-228-11 | INDUCTOR, FERRITE BEAD |
| FB704 | 1-414-228-11 | INDUCTOR, FERRITE BEAD |
| FB705 | 1-500-215-11 | BEAD, FERRITE (CHIP) |
| FB801 | 1-500-215-11 | BEAD, FERRITE (CHIP) |
| FB802 | 1-500-215-11 | BEAD, FERRITE (CHIP) |

ICS

| | | |
|-------|--------------|------------------------|
| IC306 | 8-759-097-96 | IC SM5853AF |
| IC307 | 8-759-252-90 | IC TLV2362IPW-ELM1500 |
| IC309 | 8-759-252-41 | IC TK11900MTL |
| IC310 | 8-759-159-75 | IC CXA8029N-TLM |
| IC314 | 8-759-255-51 | IC DS1267E-50-TE1 |
| IC315 | 8-759-710-79 | IC NJM2107F |
| IC320 | 8-759-173-00 | IC XC61AN1102MR |
| IC321 | 8-759-325-27 | IC TK11231AMTL |
| IC501 | 8-752-068-49 | IC CXA1861R |
| IC502 | 8-752-064-33 | IC CXA1380N |
| IC505 | 8-759-082-60 | IC TC7S66FU |
| IC506 | 8-759-252-31 | IC MB88347APFV-EF |
| IC507 | 8-752-055-94 | IC CXA1602R |
| IC509 | 8-759-084-72 | IC MPC1718FU |
| IC510 | 8-759-058-61 | IC TC7S08FU-TE85L |
| IC512 | 8-759-710-79 | IC NJM2107F |
| IC513 | 8-759-255-49 | IC DS1267E-10-TE1 |
| IC514 | 8-759-255-51 | IC DS1267E-50-TE1 |
| IC515 | 8-759-082-60 | IC TC7S66FU |
| IC516 | 8-759-058-61 | IC TC7S08FU-TE85L |
| IC517 | 8-759-259-06 | IC XC61AN1902MR |
| IC518 | 8-759-710-79 | IC NJM2107F |
| IC519 | 8-759-087-92 | IC NJM2100V |
| IC521 | 8-759-243-19 | IC TC7SU04F |
| IC522 | 8-759-082-61 | IC TC4W53FU |
| IC523 | 8-759-082-57 | IC TC7W04FU |
| IC524 | 8-759-058-61 | IC TC7S08FU-TE85L |
| IC701 | 8-752-364-98 | IC CXD2525R-1 |
| IC702 | 8-759-082-61 | IC TC4W53FU |
| IC704 | 8-759-255-94 | IC XC62AP3102MR |
| IC705 | 8-752-372-86 | IC CXD1805AR |
| IC706 | 8-759-325-34 | IC HM51W4800ALTT-7 |
| IC707 | 8-752-372-46 | IC CXD2927R |
| IC710 | 8-759-079-60 | IC TC74VHC32FS(EL) |
| IC713 | 8-752-361-11 | IC CXD1185CR |
| IC714 | 8-759-182-65 | IC MCCS142235-FA |
| IC716 | 8-759-324-26 | IC SN74LVT16245DGG-E05 |
| IC722 | 8-759-255-94 | IC XC62AP3102MR |
| IC723 | 8-759-255-94 | IC XC62AP3102MR |
| IC726 | 8-759-058-55 | IC TC7S02FU |
| IC727 | 8-759-058-61 | IC TC7S08FU-TE85L |
| IC802 | 8-759-252-55 | IC S-80745SL-A9 |
| IC804 | 8-759-252-57 | IC S-2900AUT-T1 |
| IC805 | 8-759-324-27 | IC HD6433040T00X |
| IC807 | 8-759-255-94 | IC XC62AP3102MR |
| IC809 | 8-759-259-06 | IC XC61AN1902MR |
| IC810 | 8-759-259-06 | IC XC61AN1902MR |
| IC811 | 8-759-058-57 | IC TC7S04FU-TE85L |
| IC812 | 8-759-324-25 | IC AT29LV010-20TC-A00 |
| IC813 | 8-759-054-63 | IC TLC339CNS |

| Ref. No. | Parts No. | Description |
|----------|--------------|-------------------|
| IC814 | 8-759-298-48 | IC CXD8533R |
| IC815 | 8-759-259-06 | IC XC61AN1902MR |
| IC817 | 8-759-058-57 | IC TC7S04FU-TE85L |
| IC818 | 8-759-082-55 | IC TC7W00FU |
| IC819 | 8-759-177-66 | IC TC7S14FU-TE85L |

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|-------|--------------|-------------------|
| IC820 | 8-759-287-62 | IC TC7W74FU-TE12L |
| IC821 | 8-759-083-94 | IC TC7W74FU |
| IC822 | 8-759-058-63 | IC TC7S32FU-TE85L |
| IC823 | 8-759-327-25 | IC XC62AP3502PR |
| IC824 | 8-759-252-27 | IC RS5RJ3720B |

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|-------|--------------|-------------------|
| IC825 | 8-759-058-54 | IC TC7S00FU-TE85L |
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JUMPER RESISTORS

| | | |
|------|--------------|------|
| J302 | 1-764-453-11 | JACK |
| J303 | 1-764-460-21 | JACK |

COILS

| | | | |
|------|--------------|---------------|----|
| L301 | 1-412-006-31 | INDUCTOR CHIP | 10 |
| L302 | 1-412-006-31 | INDUCTOR CHIP | 10 |
| L303 | 1-412-029-11 | INDUCTOR CHIP | 10 |
| L304 | 1-412-006-31 | INDUCTOR CHIP | 10 |
| L501 | 1-414-410-21 | INDUCTOR | 10 |

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|------|--------------|-------------|-----|
| L502 | 1-414-410-21 | INDUCTOR | 10 |
| L503 | 1-414-410-21 | INDUCTOR | 10 |
| L504 | 1-402-831-21 | COIL, CHOKE | 68 |
| L505 | 1-414-410-21 | INDUCTOR | 10 |
| L506 | 1-414-203-11 | INDUCTOR | 100 |

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|------|--------------|---------------|-----|
| L507 | 1-412-991-11 | INDUCTOR | 10 |
| L508 | 1-414-203-11 | INDUCTOR | 100 |
| L509 | 1-414-203-11 | INDUCTOR | 100 |
| L510 | 1-414-410-21 | INDUCTOR | 10 |
| L511 | 1-412-005-11 | INDUCTOR CHIP | 8.2 |

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|-------|--------------|---------------------|----|
| L801 | 1-411-162-11 | COIL, CHOKE | 33 |
| LF303 | 1-403-601-21 | FILTER, COMMON MODE | |
| LF304 | 1-239-996-11 | FILTER, EMI | |

TRANSISTORS

| | | |
|------|--------------|------------------------|
| Q307 | 8-729-929-24 | TRANSISTOR DTC143TE-TL |
| Q311 | 8-729-422-29 | TRANSISTOR 2SD601A-S |
| Q312 | 8-729-422-29 | TRANSISTOR 2SD601A-S |
| Q313 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q501 | 8-729-422-39 | TRANSISTOR XN4404 |

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|------|--------------|--------------------------|
| Q502 | 8-729-928-36 | TRANSISTOR DTA114EE |
| Q503 | 8-729-928-85 | TRANSISTOR DTC114YE-TL |
| Q506 | 8-729-923-45 | TRANSISTOR 2SB1308-OR |
| Q508 | 8-729-928-27 | TRANSISTOR DTC144EE |
| Q510 | 8-729-023-89 | TRANSISTOR 2SJ305(TE85L) |

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|------|--------------|---------------------|
| Q511 | 8-729-927-59 | TRANSISTOR UMZ1 |
| Q512 | 8-729-928-27 | TRANSISTOR DTA144EE |
| Q515 | 8-729-930-13 | TRANSISTOR UMH2 |
| Q516 | 8-729-928-90 | TRANSISTOR DTC114EE |
| Q518 | 8-729-928-81 | TRANSISTOR DTC144EE |

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|------|--------------|------------------------|
| Q519 | 8-729-928-27 | TRANSISTOR DTC144EE |
| Q520 | 8-729-928-85 | TRANSISTOR DTC114YE-TL |
| Q521 | 8-729-928-36 | TRANSISTOR DTA114EE |
| Q522 | 8-729-928-85 | TRANSISTOR DTC114YE-TL |
| Q523 | 8-729-928-19 | TRANSISTOR 2SA1774TL |

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|------|--------------|---------------------|
| Q703 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q704 | 8-729-928-81 | TRANSISTOR DTC144EE |

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|------|--------------|---------------------|
| Q802 | 8-729-930-00 | TRANSISTOR UMD2 |
| Q803 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q806 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q808 | 8-729-930-00 | TRANSISTOR UMD2 |
| Q814 | 8-729-927-99 | TRANSISTOR 2SC4617R |

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|------|--------------|---------------------|
| Q815 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q819 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q820 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q821 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q822 | 8-729-928-81 | TRANSISTOR DTC144EE |

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|------|--------------|-------------------------|
| Q823 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q824 | 8-729-928-31 | TRANSISTOR DTA114YE-TL |
| Q825 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q827 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q828 | 8-729-030-76 | TRANSISTOR 2SD1628FG-TD |

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|------|--------------|-----------------------|
| Q829 | 8-729-923-45 | TRANSISTOR 2SB1308-OR |
| Q830 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q831 | 8-729-928-81 | TRANSISTOR DTC144EE |
| Q832 | 8-729-928-81 | TRANSISTOR DTC144EE |

RESISTORS

| | | | | | |
|------|--------------|------------|-----|-------|-------|
| R121 | 1-218-873-11 | METAL CHIP | 12K | 0.50% | 1/16W |
| R122 | 1-218-873-11 | METAL CHIP | 12K | 0.50% | 1/16W |
| R124 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R125 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R126 | 1-218-736-11 | METAL CHIP | 68K | 0.50% | 1/16W |

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|------|--------------|------------------------|-----|-------|-------|
| R127 | 1-218-883-11 | METAL CHIP | 33K | 0.50% | 1/16W |
| R128 | 1-218-883-11 | METAL CHIP | 33K | 0.50% | 1/16W |
| R129 | 1-218-736-11 | METAL CHIP | 68K | 0.50% | 1/16W |
| R133 | 1-216-789-11 | METAL CHIP | 2.2 | 5% | 1/16W |
| R135 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |

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|------|--------------|------------|-----|-------|-------|
| R136 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R221 | 1-218-873-11 | METAL CHIP | 12K | 0.50% | 1/16W |
| R222 | 1-218-873-11 | METAL CHIP | 12K | 0.50% | 1/16W |
| R224 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R225 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |

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|------|--------------|------------|-----|-------|-------|
| R226 | 1-218-736-11 | METAL CHIP | 68K | 0.50% | 1/16W |
| R227 | 1-218-883-11 | METAL CHIP | 33K | 0.50% | 1/16W |
| R228 | 1-218-883-11 | METAL CHIP | 33K | 0.50% | 1/16W |
| R229 | 1-218-736-11 | METAL CHIP | 68K | 0.50% | 1/16W |
| R233 | 1-216-789-11 | METAL CHIP | 2.2 | 5% | 1/16W |

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|------|--------------|------------------------|-----|-------|-------|
| R235 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R236 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R311 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R329 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R330 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |

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|------|--------------|------------------------|-----|-------|-------|
| R331 | 1-216-843-11 | METAL CHIP | 68K | 5% | 1/16W |
| R332 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R337 | 1-216-789-11 | METAL CHIP | 2.2 | 5% | 1/16W |
| R339 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R340 | 1-218-881-11 | METAL CHIP | 27K | 0.50% | 1/16W |

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|------|--------------|------------------------|------|-------|-------|
| R341 | 1-218-732-11 | METAL CHIP | 47K | 0.50% | 1/16W |
| R342 | 1-218-692-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R349 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R350 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R351 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |

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|------|--------------|------------------------|-----|-------|-------|
| R352 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R353 | 1-218-692-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R357 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R358 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |

| Ref. No. | Parts No. | Description | | | |
|----------|--------------|--------------------------|------|-------|-------|
| R361 | 1-216-813-11 | METAL CHIP | 220 | 5% | 1/16W |
| R362 | 1-216-813-11 | METAL CHIP | 220 | 5% | 1/16W |
| R363 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R364 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R365 | 1-216-813-11 | METAL CHIP | 220 | 5% | 1/16W |
| R366 | 1-218-882-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R367 | 1-218-882-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R368 | 1-216-813-11 | METAL CHIP | 220 | 5% | 1/16W |
| R373 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R376 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R377 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R378 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R379 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R381 | 1-216-864-11 | CONDUCTOR, CHIP (1608) 0 | | | |
| R501 | 1-216-847-11 | METAL CHIP | 150K | 5% | 1/16W |
| R502 | 1-216-818-11 | METAL CHIP | 560 | 5% | 1/16W |
| R506 | 1-216-844-11 | METAL CHIP | 82K | 5% | 1/16W |
| R507 | 1-216-825-11 | METAL CHIP | 2.2K | 5% | 1/16W |
| R510 | 1-218-900-11 | METAL CHIP | 180K | 0.50% | 1/16W |
| R511 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R512 | 1-218-448-11 | METAL CHIP | 430K | 5% | 1/16W |
| R513 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R514 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R515 | 1-218-899-11 | METAL CHIP | 150K | 0.50% | 1/16W |
| R516 | 1-216-844-11 | METAL CHIP | 82K | 5% | 1/16W |
| R519 | 1-218-688-11 | METAL CHIP | 680 | 0.50% | 1/16W |
| R520 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R521 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R522 | 1-218-710-11 | METAL CHIP | 5.6K | 0.50% | 1/16W |
| R526 | 1-218-692-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R527 | 1-216-835-11 | METAL CHIP | 15K | 5% | 1/16W |
| R529 | 1-218-734-11 | METAL CHIP | 56K | 0.50% | 1/16W |
| R531 | 1-216-809-11 | METAL CHIP | 100 | 5% | 1/16W |
| R533 | 1-216-813-11 | METAL CHIP | 220 | 5% | 1/16W |
| R535 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R536 | 1-216-001-00 | METAL CHIP | 10 | 5% | 1/10W |
| R539 | 1-218-710-11 | METAL CHIP | 5.6K | 0.50% | 1/16W |
| R540 | 1-218-708-11 | METAL CHIP | 4.7K | 0.50% | 1/16W |
| R546 | 1-218-692-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R547 | 1-216-825-11 | METAL CHIP | 2.2K | 5% | 1/16W |
| R549 | 1-216-825-11 | METAL CHIP | 2.2K | 5% | 1/16W |
| R550 | 1-216-846-11 | METAL CHIP | 120K | 5% | 1/16W |
| R551 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R553 | 1-216-836-11 | METAL CHIP | 18K | 5% | 1/16W |
| R556 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R557 | 1-216-859-11 | METAL CHIP | 1.5M | 5% | 1/16W |
| R558 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R559 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R561 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R566 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R567 | 1-216-854-11 | METAL CHIP | 560K | 5% | 1/16W |
| R568 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R571 | 1-216-817-11 | METAL CHIP | 470 | 5% | 1/16W |
| R572 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R573 | 1-216-843-11 | METAL CHIP | 68K | 5% | 1/16W |
| R574 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R575 | 1-216-849-11 | METAL CHIP | 220K | 5% | 1/16W |
| R576 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R577 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R578 | 1-216-848-11 | METAL CHIP | 180K | 5% | 1/16W |

| Ref. No. | Parts No. | Description | | | |
|----------|--------------|--------------------------|------|-------|-------|
| R582 | 1-218-873-11 | METAL CHIP | 12K | 0.50% | 1/16W |
| R590 | 1-216-851-11 | METAL CHIP | 330K | 5% | 1/16W |
| R592 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R593 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R594 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R702 | 1-216-852-11 | METAL CHIP | 390K | 5% | 1/16W |
| R703 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R704 | 1-218-710-11 | METAL CHIP | 5.6K | 0.50% | 1/16W |
| R706 | 1-216-864-11 | CONDUCTOR, CHIP (1608) 0 | | | |
| R707 | 1-218-704-11 | METAL CHIP | 3.3K | 0.50% | 1/16W |
| R708 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R709 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R712 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R736 | 1-216-864-11 | CONDUCTOR, CHIP (1608) 0 | | | |
| R737 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R738 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R739 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R742 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R743 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R744 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R745 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R746 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R747 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R748 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R749 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R750 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R751 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R752 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R753 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R754 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R755 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R756 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R757 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R758 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R759 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R760 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R761 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R762 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R763 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R765 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R766 | 1-216-864-91 | CONDUCTOR, CHIP (1608) 0 | | | |
| R803 | 1-218-701-11 | METAL CHIP | 2.4K | 0.50% | 1/16W |
| R804 | 1-218-694-11 | METAL CHIP | 1.2K | 0.50% | 1/16W |
| R805 | 1-218-701-11 | METAL CHIP | 2.4K | 0.50% | 1/16W |
| R806 | 1-218-694-11 | METAL CHIP | 1.2K | 0.50% | 1/16W |
| R808 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R810 | 1-216-851-11 | METAL CHIP | 330K | 5% | 1/16W |
| R815 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R816 | 1-218-870-11 | METAL CHIP | 9.1K | 0.50% | 1/16W |
| R825 | 1-216-851-11 | METAL CHIP | 330K | 5% | 1/16W |
| R833 | 1-216-863-11 | METAL CHIP | 3.3M | 5% | 1/16W |
| R835 | 1-216-851-11 | METAL CHIP | 330K | 5% | 1/16W |
| R836 | 1-216-851-11 | METAL CHIP | 330K | 5% | 1/16W |
| R838 | 1-216-851-11 | METAL CHIP | 330K | 5% | 1/16W |
| R842 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R844 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R862 | 1-216-846-11 | METAL CHIP | 120K | 5% | 1/16W |
| R863 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R868 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R869 | 1-216-853-11 | METAL CHIP | 470K | 5% | 1/16W |

| Ref. No. | Parts No. | Description | | | |
|----------|--------------|------------------------|------|-------|-------|
| R870 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R871 | 1-216-851-11 | METAL CHIP | 330K | 5% | 1/16W |
| R872 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R873 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R878 | 1-216-863-11 | METAL CHIP | 3.3M | 5% | 1/16W |
| R880 | 1-216-863-11 | METAL CHIP | 3.3M | 5% | 1/16W |
| R883 | 1-216-829-11 | METAL CHIP | 4.7K | 5% | 1/16W |
| R884 | 1-216-829-11 | METAL CHIP | 4.7K | 5% | 1/16W |
| R885 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R886 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R887 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R888 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R889 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R890 | 1-218-873-11 | METAL CHIP | 12K | 0.50% | 1/16W |
| R891 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R892 | 1-218-716-11 | METAL CHIP | 10K | 0.50% | 1/16W |
| R893 | 1-218-873-11 | METAL CHIP | 12K | 0.50% | 1/16W |
| R894 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R895 | 1-218-873-11 | METAL CHIP | 12K | 0.50% | 1/16W |
| R896 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R897 | 1-218-716-11 | METAL CHIP | 10K | 0.50% | 1/16W |
| R898 | 1-218-873-11 | METAL CHIP | 12K | 0.50% | 1/16W |
| R899 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R5001 | 1-218-694-11 | METAL CHIP | 1.2K | 0.50% | 1/16W |
| R5010 | 1-218-692-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R5011 | 1-218-692-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R5012 | 1-218-692-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R5014 | 1-218-692-11 | METAL CHIP | 1K | 0.50% | 1/16W |
| R5015 | 1-218-883-11 | METAL CHIP | 33K | 0.50% | 1/16W |
| R5016 | 1-218-883-11 | METAL CHIP | 33K | 0.50% | 1/16W |
| R5017 | 1-216-843-11 | METAL CHIP | 68K | 5% | 1/16W |
| R5018 | 1-216-843-11 | METAL CHIP | 68K | 5% | 1/16W |
| R5020 | 1-216-860-11 | METAL CHIP | 1.8M | 5% | 1/16W |
| R5021 | 1-216-849-11 | METAL CHIP | 220K | 5% | 1/16W |
| R5027 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R5030 | 1-216-846-11 | METAL CHIP | 120K | 5% | 1/16W |
| R5032 | 1-216-843-11 | METAL CHIP | 68K | 5% | 1/16W |
| R5039 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R5056 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R5057 | 1-216-848-11 | METAL CHIP | 180K | 5% | 1/16W |
| R5081 | 1-218-867-11 | METAL CHIP | 6.8K | 0.50% | 1/16W |
| R5082 | 1-216-001-00 | METAL CHIP | 10 | 5% | 1/10W |
| R5092 | 1-216-812-11 | METAL CHIP | 180 | 5% | 1/16W |
| R5095 | 1-216-859-11 | METAL CHIP | 1.5M | 5% | 1/16W |
| R5098 | 1-218-883-11 | METAL CHIP | 33K | 0.50% | 1/16W |
| R5099 | 1-218-881-11 | METAL CHIP | 27K | 0.50% | 1/16W |
| R5100 | 1-218-724-11 | METAL CHIP | 22K | 0.50% | 1/16W |
| R5102 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R5103 | 1-218-708-11 | METAL CHIP | 4.7K | 0.50% | 1/16W |
| R5105 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R5107 | 1-218-730-11 | METAL CHIP | 39K | 0.50% | 1/16W |
| R5108 | 1-218-730-11 | METAL CHIP | 39K | 0.50% | 1/16W |
| R5109 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R5116 | 1-216-796-11 | METAL CHIP | 8.2 | 5% | 1/16W |
| R5117 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R5200 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R5202 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R5206 | 1-216-013-00 | METAL CHIP | 33 | 5% | 1/10W |
| R5207 | 1-216-013-00 | METAL CHIP | 33 | 5% | 1/10W |
| R5211 | 1-216-825-11 | METAL CHIP | 2.2K | 5% | 1/16W |

| Ref. No. | Parts No. | Description | | | |
|----------|--------------|------------------------|------|-------|-------|
| R5212 | 1-216-825-11 | METAL CHIP | 2.2K | 5% | 1/16W |
| R5213 | 1-216-843-11 | METAL CHIP | 68K | 5% | 1/16W |
| R5214 | 1-218-740-11 | METAL CHIP | 100K | 0.50% | 1/16W |
| R5215 | 1-216-843-11 | METAL CHIP | 68K | 5% | 1/16W |
| R5216 | 1-218-716-11 | METAL CHIP | 10K | 0.50% | 1/16W |
| R5217 | 1-216-843-11 | METAL CHIP | 68K | 5% | 1/16W |
| R5229 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R5230 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R5232 | 1-216-824-11 | METAL CHIP | 1.8K | 5% | 1/16W |
| R5233 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R5234 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R5235 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R5237 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R5239 | 1-216-839-11 | METAL CHIP | 33K | 5% | 1/16W |
| R5240 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R5241 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R5242 | 1-216-821-11 | METAL CHIP | 1K | 5% | 1/16W |
| R5243 | 1-218-710-11 | METAL CHIP | 5.6K | 0.50% | 1/16W |
| R5244 | 1-216-834-11 | METAL CHIP | 12K | 5% | 1/16W |
| R5246 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R5247 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R8000 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R8001 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R8008 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8009 | 1-218-883-11 | METAL CHIP | 33K | 0.50% | 1/16W |
| R8010 | 1-218-716-11 | METAL CHIP | 10K | 0.50% | 1/16W |
| R8011 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8016 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R8017 | 1-216-863-11 | METAL CHIP | 3.3M | 5% | 1/16W |
| R8018 | 1-216-851-11 | METAL CHIP | 330K | 5% | 1/16W |
| R8019 | 1-218-749-11 | METAL CHIP | 240K | 0.50% | 1/16W |
| R8020 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R8030 | 1-216-857-11 | METAL CHIP | 1M | 5% | 1/16W |
| R8031 | 1-218-883-11 | METAL CHIP | 33K | 0.50% | 1/16W |
| R8032 | 1-218-720-11 | METAL CHIP | 15K | 0.50% | 1/16W |
| R8033 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R8034 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R8043 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8045 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R8046 | 1-216-837-11 | METAL CHIP | 22K | 5% | 1/16W |
| R8047 | 1-216-833-11 | METAL CHIP | 10K | 5% | 1/16W |
| R8048 | 1-216-822-11 | METAL CHIP | 1.2K | 5% | 1/16W |
| R8049 | 1-216-863-11 | METAL CHIP | 3.3M | 5% | 1/16W |
| R8053 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8056 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8059 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8060 | 1-216-849-11 | METAL CHIP | 220K | 5% | 1/16W |
| R8061 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8062 | 1-216-841-11 | METAL CHIP | 47K | 5% | 1/16W |
| R8064 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R8065 | 1-216-864-11 | CONDUCTOR, CHIP (1608) | 0 | | |
| R8067 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8068 | 1-216-851-11 | METAL CHIP | 330K | 5% | 1/16W |
| R8070 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8071 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8072 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8075 | 1-216-039-00 | METAL CHIP | 390 | 5% | 1/10W |
| R8078 | 1-216-033-00 | METAL CHIP | 220 | 5% | 1/10W |
| R8079 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R8080 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |

| Ref. No. | Parts No. | Description |
|-------------|--------------|------------------------------|
| R8081 | 1-216-039-00 | METAL CHIP 390 5% 1/10W |
| SWITCHES | | |
| S701 | 1-762-240-11 | SWITCH, DIP |
| S805 | 1-571-506-41 | SWITCH, SLIDE (DT/AU) |
| S806 | 1-571-275-31 | SWITCH, SLIDE (AVLS) |
| OSCILLATORS | | |
| X701 | 1-760-489-11 | VIBRATOR, CERAMIC 25MHz |
| X703 | 1-579-725-21 | VIBRATOR, CRYSTAL 22.5792MHz |
| X801 | 1-760-365-11 | VIBRATOR, CERAMIC 10M |

>>> MECH-CON MOUNTED BOARD (A-3264-998-A) <<<

| | | | | | |
|------------|--------------|--------------|--------|-----|------|
| CAPACITORS | | | | | |
| C701 | 1-164-227-11 | CERAMIC CHIP | 0.022 | 10% | 25V |
| C702 | 1-165-176-00 | CERAMIC CHIP | 0.047 | 10% | 16V |
| C703 | 1-164-227-11 | CERAMIC CHIP | 0.022 | 10% | 25V |
| C704 | 1-164-326-11 | CERAMIC CHIP | 0.47 | | 16V |
| C705 | 1-162-964-11 | CERAMIC CHIP | 0.001 | 5% | 50V |
| C706 | 1-162-964-11 | CERAMIC CHIP | 0.001 | 5% | 50V |
| C707 | 1-162-964-11 | CERAMIC CHIP | 0.001 | 5% | 50V |
| C708 | 1-162-967-11 | CERAMIC CHIP | 0.0033 | 5% | 50V |
| C709 | 1-107-725-11 | CERAMIC CHIP | 0.1 | 10% | 16V |
| C710 | 1-164-326-11 | CERAMIC CHIP | 0.47 | | 16V |
| C711 | 1-164-156-11 | ELECT | 0.1 | | 25V |
| C712 | 1-162-970-11 | ELECT | 0.01 | 10% | 25V |
| C713 | 1-162-970-11 | CERAMIC CHIP | 0.01 | 10% | 25V |
| C714 | 1-107-813-11 | TANTAL CHIP | 10 | 20% | 6.3V |
| C715 | 1-162-970-11 | CERAMIC CHIP | 0.01 | 10% | 25V |
| C716 | 1-107-813-11 | TANTAL CHIP | 0.01 | 20% | 6.3V |

CONNECTORS

| | | |
|-------|--------------|-----------------------------|
| CN701 | 1-573-925-11 | FFC/FPC CONNECTOR (ZIF) 16P |
| CN702 | 1-573-915-11 | FFC/FPC CONNECTOR (ZIF) 6P |

TRANSISTORS

| | | |
|------|--------------|---------------------|
| Q701 | 8-729-905-12 | TRANSISTOR DTA144EU |
| Q702 | 8-729-904-07 | TRANSISTOR FMG2 |

ICS

| | | |
|-------|--------------|----------------|
| IC701 | 8-759-098-52 | IC CXA8027N |
| IC702 | 8-759-252-32 | IC MPC1730VMEL |

RESISTORS

| | | | | | |
|------|--------------|------------|------|-------|-------|
| R701 | 1-216-716-11 | FILM CHIP | 10K | 0.50% | 1/16W |
| R702 | 1-216-716-11 | FILM CHIP | 10K | 0.50% | 1/16W |
| R703 | 1-216-815-11 | METAL CHIP | 330 | 5% | 1/10W |
| R704 | 1-217-671-11 | METAL CHIP | 1 | 5% | 1/10W |
| R705 | 1-217-671-11 | METAL CHIP | 1 | 5% | 1/10W |
| R706 | 1-216-827-11 | METAL CHIP | 3.3K | 5% | 1/16W |
| R708 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |
| R709 | 1-216-845-11 | METAL CHIP | 100K | 5% | 1/16W |

| Ref. No. | Parts No. | Description |
|----------|--------------|----------------------|
| SWITCHES | | |
| S701 | 1-692-849-21 | SWITCH, PUSH (1 KEY) |
| S702 | 1-692-847-21 | SWITCH, PUSH (1 KEY) |
| S703 | 1-692-377-21 | SWITCH, PUSH (1 KEY) |
| S704 | 1-572-467-41 | SWITCH, PUSH (1 KEY) |
| S705 | 1-572-467-41 | SWITCH, PUSH (1 KEY) |

>>> REC MOUNTED BOARD (A-3264-996-A) <<<

CAPACITORS

| | | | | | |
|------|--------------|--------------|-------|-----|------|
| C901 | 1-164-360-11 | CERAMIC CHIP | 0.1 | | 16V |
| C902 | 1-107-810-11 | TANTAL CHIP | 33 | 20% | 4V |
| C903 | 1-109-814-11 | MICA CHIP | 220PF | 5% | 100V |
| C904 | 1-165-112-11 | CERAMIC CHIP | 0.33 | | 16V |

CONNECTORS

| | | |
|-------|--------------|----------------------------|
| CN901 | 1-573-915-11 | FFC/FPC CONNECTOR (ZIF) 6P |
| CN902 | 1-573-915-11 | FFC/FPC CONNECTOR (ZIF) 6P |

DIODES

| | | |
|------|--------------|------------|
| D901 | 8-719-046-87 | DIODE F1J6 |
| D902 | 8-719-046-87 | DIODE F1J6 |

TRANSISTORS

| | | |
|------|--------------|----------------------|
| Q901 | 8-729-024-45 | TRANSISTOR 2SK2315TY |
| Q902 | 8-729-024-45 | TRANSISTOR 2SK2315TY |
| Q903 | 8-729-024-45 | TRANSISTOR 2SK2315TY |
| Q904 | 8-729-024-45 | TRANSISTOR 2SK2315TY |

ICS

| | | |
|-------|--------------|-------------------|
| IC901 | 8-759-252-34 | IC MC74ACT540DTEL |
|-------|--------------|-------------------|

RESISTORS

| | | | | | |
|------|--------------|------------|------|----|-------|
| R901 | 1-216-853-11 | METAL CHIP | 470k | 5% | 1/16W |
| R902 | 1-216-853-11 | METAL CHIP | 470k | 5% | 1/16W |
| R903 | 1-216-853-11 | METAL CHIP | 470k | 5% | 1/16W |
| R904 | 1-216-853-11 | METAL CHIP | 470k | 5% | 1/16W |
| R905 | 1-216-853-11 | METAL CHIP | 470k | 5% | 1/16W |